SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 18
SEPTEMBER 15, 1974

W74-09251 -- W74-09800

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription is $45 (domestic), $56.25 (foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Deoartment of the Interior

VOLUME 7, NUMBER 18
SEPTEMBER 15, 1974

W74-09251 -- W74-09800

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

SYMPOSIUM ON THE HYDROLOGY OF GLACIERS,
For primary bibliographic entry see Field 2C.
W74-09325

ON THE POSSIBILITY OF ARTIFICIAL CONTROL OF THE MASS BALANCE OF A PERENNIAL SNOW PATCH,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 2C.
W74-09342

INFLUENCE OF CHANGES IN THE GLACIERZED AREA ON SUMMER RUN-OFF IN THE PORTE DU SCEX DRAINAGE BASIN OF THE RHONE,
Eidgenoessfische Technishe Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau und Erdbau.
For primary bibliographic entry see Field 2C.
W74-09344

ROLE OF ICE RUN-OFF IN THE WATER BALANCE OF THE MOUNTAIN AREA OF CENTRAL ASIA,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 2C.
W74-09345

HYDROLOGICAL REGIME OF GLACIERS IN THE ALAY RANGE, CENTRAL ASIA,
Sredneasiatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 2C.
W74-09346

INFILTRATION AND RUN-OFF OF MELT WATER ON GLACIERS,
Institute of Geography, USSR Academy of Sciences, Moscow.
For primary bibliographic entry see Field 2C.
W74-09347

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
For primary bibliographic entry see Field 2H.
W74-09350

PROGRESS REPORT ON THE EFFECT OF GROUND-WATER CONDITIONS ON LOCAL FLOODING IN THE KINGSTON AREA, PA.,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-09366

CALCULATION OF NATURAL CATCHMENT INFILTRATION BY COMPUTER,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 7C.
W74-09367

HYDROLOGIC DATA STORAGE AND RETRIEVAL SYSTEM,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 7C.
W74-09401

CALIBRATION OF U.S. GEOLOGICAL SURVEY RAINFALL/RUNOFF MODEL FOR PEAK FLOW SYNTHESIS--NATURAL BASINS,
Geological Survey, Reston, Va.
P. H. Carrigan, Jr.
Available from NTIS, Springfield, Va. 22151 as PB-226 217 - Price $3.00 printed copy; $1.45 microfiche. Computer Contribution Report, September 1973. 109 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Computer programs, *Calibrations, *Mathematical models, *Rainfall-runoff relationships, Peak discharge, Floods.

This program determines the parameters of a rainfall-runoff model which is used to synthesize flood peaks. The calibration is based on short-term (about 5 years) records of daily rainfall, of daily evaporation, of unit rainfall (rainfall during an interval of usually 5 to 60 minutes), and of unit discharge. The method of calibration is similar to a least squares determination of coefficients in regression analysis. The calibration adjusts 10 parameters to seek the minimum mean square error in estimating surface runoff volume and flood peak magnitude. The user may select which of 10 parameters are to be adjusted, which of the events in the list of flood peaks are to be used for calibration, and the particular mean square errors to be minimized (runoff volume, peak discharge, or both). The printed output identifies the records used for calibration, indicates periods of record and dates of events, provides comparison of observed and synthetic surface runoff volumes and peaks, and tabulates parameters and mean square errors at progressive stages in the calibration process. (Knapp-USGS)
W74-09603

WATER--A PRIMER,
California Univ., Berkeley.
L. B. Leopold.
W. H. Freeman and Company, San Francisco, Calif, 1974. 172 p.

Descriptors: *Hydrology, *Hydrologic cycle, Surface waters, Groundwater, Precipitation(Atmospheric), Streamflow, Water chemistry, Water quality, Floods, Soil-water-plant relationships, Soil water, Soil moisture, Water utilization, Evapotranspiration.

This short book is designed to cover the general principles of hydrology and the facts concerning water use that must precede consideration of the impact on the environment of man's use of the water resource. The environmental effects of resource use cannot be understood without knowledge of the occurrence and movement of water. (Knapp-USGS)
W74-09613

INDEPENDENT COMPARISON OF THREE URBAN RUNOFF MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
D. P. Heeps, and R. G. Mein.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10685, p 995-1009, July 1974. 6 fig, 4 tab, 18 ref, 2 append.

Descriptors: *Urban runoff, *Urban hydrology, *Storm runoff, Mathematical models, Rainfall-runoff relationships, Urbanization, Urban drainage.
Identifiers: *Australia.

Three urban runoff models (the Road Research Laboratory hydrograph method, the Storm Water Management Model, and the Cincinnati Urban Runoff Model) were applied to two urban catchments in Australia. The Road Research Laboratory method generally performed well if runoff from previous areas was insignificant. The Storm Water Management Model was best of the three models but also required the most computer time. The Cincinnati Urban Runoff Model contained several deficiencies which caused poor performance. Degree of catchment subdivision was an important factor in the magnitude of the peak predicted. (Knapp-USGS)
W74-09629

NEW DATA ON WATER CIRCULATION IN THE ARCTIC BASIN (NOVYYE DANNYYE O TSIRKULYATSII VOD ARKTICHESKOGO BASSEYNA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W74-09649

SOME STATISTICAL ANALYSES OF HAWAIIAN RAINFALL,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W74-09655

2B. Precipitation

VARIATIONS IN THE RELATION BETWEEN GLACIER DISCHARGE AND METEOROLOGICAL ELEMENTS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau und Erdbau.
For primary bibliographic entry see Field 2C.
W74-09330

PROJECT CUM II--STUDIES OF THE RAIN PARAMETERS OF RANDOMLY SEEDED WARM AND COLD CUMULI,
Weather Science, Inc., Norman, Okla.
For primary bibliographic entry see Field 3B.
W74-09370

WEATHER SITUATIONS ASSOCIATED WITH FLOODS DURING 1972,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2E.
W74-09392

AN INVESTIGATION OF THE MICROPHYSICAL AND MICROMETEOROLOGICAL PROPERTIES OF SEA FOG, FIRST SUMMARY REPORT, PROJECT SEA FOG,
Calspan Corp., Buffalo, N.Y.
E. J. Mack, R. J. Pilie, and W. C. Kocmond.
Available from NTIS, Springfield, Va. 22151 as AD-767 376 Price $3.00 printed copy; $1.45 microfiche. Technical Report No CJ-5237-M-1, May 1973. 40 p, 12 fig, 2 tab, 11 ref, append. Navy Contract N00019-73-C-0094.

Descriptors: *Fog, *Meteorology, *Cloud physics, Weather, Climatology, *California, Clouds, Water temperature, Data collections, Instrumentation.

The microphysical and micrometeorological characteristics of two fogs occurring at sea 30 nmi off the coast of California were measured. The fogs exhibited formation features, vertical temperature structure and microphysical characteristics similar to those observed on shore in California coastal fog. One of the fogs formed over cold water, while the other formed over relatively warm water; in each instance, marked visibility improvements were observed at the surface downwind of abrupt gradients in surface water temperature. Fog occurrence at the surface at distances exceeding 30 nmi off shore is definitely a diurnal effect; radiational cooling at the top of the fog is much more important than has been previously considered. (Knapp-USGS)
W74-09406

GROUND-WATER CONDITIONS CAUSED BY TROPICAL STORM AGNES,
Susquehanna River Basin Commission, Mechanicsburg, Pa.
For primary bibliographic entry see Field 4B.
W74-09532

MEAN PRECIPITATION AND SNOWFALL MAPS FOR A MOUNTAINOUS AREA OF POTENTIAL URBAN DEVELOPMENT,
Atmospheric Environment Service, Vancouver, (British Columbia).
For primary bibliographic entry see Field 2C.
W74-09612

SOME STATISTICAL ANALYSES OF HAWAIIAN RAINFALL,
Hawaii Univ., Honolulu. Water Resources Research Center.
E. D. H. Cheng, and L. S. Lau.
Available from the National Technical Information Service as PB-233 674, $3.75 in paper copy, $1.45 in microfiche. Technical Report No 72, August 1973. 63 p, 10 fig, 12 tab, 15 ref, 2 append. OWRR A-029-HI(1). 14-01-0001-3011.

Descriptors: *Hawaii, Watersheds(Basins), *Regression analysis, Rainfall, Rain gages, Precipitation(Atmospheric), Stability, Variability, *Rainfall intensity, Cloudbursts, *Statistical methods.
Identifiers: *Oahu(HI).

Monthly rainfall data of several stations in Kalihi Basin, Manoa Basin, and Kaneohe Area, all on Oahu, and the central sloping area of Molokai were correlated to watershed parameters of the areas. Distance measured from the station to a common station located seaward from all stations has proven to be the most important of the three parameters studied, the other two being the exposure and the elevation of the area. Both linear and nonlinear regression functions were developed. The central tendency of the monthly rainfall for the high rainfall part of the southeastern part of the Island of Oahu was found to require approximately forty years of record to stabilize. The analysis also shows that mean converges to a specified level generally faster than median. The intensity-duration relation of intense rain for specified recurrence interval for the high rainfall part of the Manoa Basin portrays accurately an inverse straight-line relationship on a plot of log-log coordinates, suggesting extension of effort to other climatically widely different regions in Hawaii. The developed relation agrees well with the reported finding of a prior Weather Bureau study employing a different approach.
W74-09655

2C. Snow, Ice, and Frost

SNOW SURVEY AND VEGETATION GROWTH IN HIGH MOUNTAINS (SWISS ALPS),
Zurich Univ. (Switzerland). Geographisches Institut.
H. Haefner.
Available from NTIS, Springfield, Va. 22151 as N73-23446, Price $3.00 printed copy; $1.45 microfiche. Progress Report to National Aeronautics and Space Administration, 1973. 13 p.

Descriptors: *Remote sensing, *Snow cover, *Alpine, Photogrammetry, Europe, Satellites(Artificial), Aerial photography, Mapping, Snow surveys.
Identifiers: ERTS.

A method for mapping snow over large areas combines ERTS satellite remote sensing to evaluate the exact density level of the snow cover for each individual image (or a selected section of the photo) with the higher resolution of aerial photographic techniques. Bands 4 and 5 provide the most accurate results for mapping snow. Using all four bands a separation of an old melting snow cover from a new one is possible. Regional meteorological studies combining data from ground observation, vertical temperature and humidity profiles, weather maps and meteorological satellite pictures with ERTS images describe the synoptical evolution of mesoscale and microscale meteorological systems over the Alps. (Knapp-USGS)
W74-09320

SYMPOSIUM ON THE HYDROLOGY OF GLACIERS,
Proceeding of Symposium held September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, 1973. 262 p.

Descriptors: *Glaciohydrology, *Hydraulics, *Melt water, Glaciers, Glaciology, Conferences, Infiltration, Percolation, Water yield, Water circulation, Melting, Freezing, Movement, Porous media.

An international conference was held on the hydrology of glaciers. The intention was to focus attention on those problems of glaciers in which water plays a dominant part. In the ablation zone of a glacier during the melt season streams of water flow over its surface. These streams often disappear from view into the depths of the glacier, and water from melting snow percolates downwards through the snow; and at the end of the glacier water is seen to emerge from the ice, often in the form of a single large stream. Streamflow derived from glaciers is an important resource because it is large in volume for unit area of catchment because it comes from places where precipitation is high or where snow is trapped efficiently, and it is highest in hot summers when the need is greatest. Because glacier streamflow originates at high altitudes it allows efficient generation of hydroelectric power. The use of this source of water requires understanding of the hydraulics and hydrology of glaciers. (See also W74-09326 thru W74-09349) (Knapp-USGS)
W74-09325

THE PRODUCTION, FLOW AND DISTRIBUTION OF MELT WATER IN A GLACIER TREATED AS A POROUS MEDIUM,
Geological Survey, Tacoma, Wash.
W. J. Campbell, and L. A. Rasmussen.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 11-27, 1973. 13 fig, 9 ref.

Descriptors: *Glaciohydrology, *Melt water, *Groundwater movement, Glaciers, Water balance, Water yield, Unsteady flow, Simulation analysis, Ablation, Mathematical models, Snowpacks, Firn, Porous media.
Identifiers: *South Cascade Glacier.

The meltwater outflow of a glacier was studied in relation to its meteorological environment in South Cascade Glacier by devising a flow law for water movement within the glacier and devising a method to compute the ice-melt over the entire glacier surface for short time scales to obtain a realistic input. The glacier is assumed to be a porous medium in which a Darcy flow exists. This law is combined with the continuity equation for free surface flow to yield an equation which describes the flow and distribution of melt water for an arbitrarily shaped glacier for which the spatial and temporal melt-water input is known. This model was applied to South Cascade Glacier for August 11-16, a period in which the dominant part of the energy balance was radiative. The daily nonradiative melt and long-wave melt during the periods studied amounted to slightly less than one-third of the total melt. This was assumed to be constant and uniform over the glacier during the period modelled. The shape of the bed has a primary effect on the character of the outflow curve. For the actual bed the outflow curve closely resembles the observed outflow. The internal flow solutions show a multiple water transport wave. Although this model is based on a simple physical concept, it reasonably approximates the outflow from a real glacier and offers some ideas for the flow of water within the glacier. (See also W74-09325) (Knapp-USGS)
W74-09326

GLACIER DISCHARGE SIMULATION BY GROUND-WATER ANALOGUE,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
L. Derikx.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 29-40, 1973. 6 fig, 1 tab, 11 ref, append.

Descriptors: *Glaciohydrology, *Melt water, *Groundwater movement, Glaciers, Canada, Water balance, Water yield, Unsteady flow, Simulation analysis, Ablation, Mathematical models, Snowpacks, Firn, Porous media.

To simulate discharge from a glacier, the drainage basin is considered analogous to a groundwater system. The daily input into the system is precipitation and water from melting snow and ice computed from meteorological data. Outflow rates are computed by use of methods originally derived for nonsteady groundwater flow. The daily discharge of a glacial stream is the output of a system operating by the linearized Boussinesq's equation with time-invariant boundary conditions. The parameter of the system is dependent on the type of glacier, time of year, climate, and probably the slope of the glacier surface. Data from Peyto Glacier, Alberta, Canada, for the ablation period 1968 were used to test the preliminary discharge-simulation model. (See also W74-09325) (Knapp-USGS)
W74-09327

ANALYSIS OF THE RUN-OFF AND FLOW ROUTING FOR A MOUNTAIN GLACIER BASIN,
Moscow State Univ., (USSR).
G. N. Golubev.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 41-50, 1973. 4 fig, 4 ref.

Descriptors: *Glaciohydrology, *Ablation, *Routing, Melt water, Runoff forecasting, Melting, Snowmelt, Firn, Water balance, Base flow, Hydrograph analysis.

The difference between the values of the inflow of melted ice or water on the surface of a glacier and the runoff for short periods of time is due to the stream-flow control by the glacier. The average basin lag is directly dependent on the area of a glacier. The stream-flow control of the firn area is greater than that of the glacier tongue, and the basin lag of the firn area is approximately ten times longer. This difference is due to the fact that day peaks are a result of runoff from the glacier tongue, and the base flow of the hydrograph is a result of runoff from the firn. For a period of time of sufficient duration, it is possible to calculate directly the runoff by ablation, disregarding the stream-flow control. Such a period of time is a function of the glacier area. For short periods of time, calculation of the glacier runoff is by ablation taking into account the stream-flow control. For this purpose three methods of calculation are suggested: (1) flood-wave routing, (2) the time-area-concentration curve, and (3) the unit hydrograph. (See also W74-09325) (Knapp-USGS)

W74-09328

WATER MOVEMENT THROUGH THE GORNERGLETSCHER,
Hull Univ., (England). Dept. of Geography.
G. R. Elliston.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 79-84, 1973. 3 fig, 3 tab, 1 ref.

Descriptors: *Glaciohydrology, *Water level fluctuations, Ablation, Melt water, Discharge(Water), Base flow, Stream gages, Glaciers, Glaciology, Melting.
Identifiers: *Switzerland(Gornergletscher).

On the river draining the Gornergletscher, a diurnal rhythm in water levels is superimposed upon a base flow whose volume varies more slowly. When summer snowfalls greatly reduce ablation and runoff, the diurnal rhythm disappears and there is a slower decline in the base flow over several days until bare ice reappears. Even when ablation is renewed at a high rate, the daily rhythm does not resume its former amplitude for several days until the base flow also recovers its former volume. The peak flow in the daily rhythm occurs earlier in the day as the summer progresses, and the time constant lessens during the ablation season. It is suggested that during the ablation season a large quantity of water is present in the body of the glacier in reservoirs which are continuously draining out but which are topped up intermittently by melt water. The rate of discharge of the main outlet depends upon the hydrostatic pressures in the reservoirs, and the diurnal rhythm is mainly a reaction to diurnal changes in the hydrostatic pressure. During the ablation season the reservoir exits are enlarged, enabling the rate of discharge to increase. (See also W74-09325) (Knapp-USGS)
W74-09329

VARIATIONS IN THE RELATION BETWEEN GLACIER DISCHARGE AND METEOROLOGICAL ELEMENTS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau und Erdbau.
H. Lang.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 85-94, 1973. 5 fig, 3 tab, 4 ref.

Descriptors: *Glaciohydrology, *Ablation, *Melt water, Water yield, Meteorology, Snow cover, Precipitation(Atmospheric), Regression analysis, Temperature, Discharge(Water), Glaciers.

For two glacierized drainage basins in the Swiss Alps (Aletschgletscher: 195 sq km drainage area, 67% glaciers; and Roseggletscher: 67sq km drainage area, 33% glaciers), some of the characteristics of the variations in the relation between discharge and meteorological elements which occur in the course of an ablation season were studied. The daily values of 4 years of records were treated by regression techniques with discharge as a dependent variable and air temperature, sunshine duration, vapor pressure and precipitation as independents. The ablation seasons were subdivided into four periods; each interval taken over the 4 years of records provided one sample. The results of the regression analysis clearly show the influence of the variable snow cover and its areal distribution for both drainage basins. The differences in the altitude distributions of total and of glacier area between the two drainage basins are reflected particularly by the correlation between discharge and temperature respectively to precipitation. The multiple correlation coefficients verify the vapor pressure as an important variable. The maximum in the correlation function of discharge and air temperature was taken to determine the mean delay in melt-water runoff; in the course of the ablation season the delay decreases from about 2-3 to about 1-2 d. A recession coefficient, calculated from mean daily variations of discharge from the Aletschgletscher basin, indicates a very significant decrease in runoff delay from June to July. (See also W74-09325) (Knapp-USGS)
W74-09330

RECORD OF TWO JOKULLHLAUPS,
British Columbia Univ., Vancouver. Dept. of Geology.
W. H. Mathews.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 99-110, 1973. 3 fig, 3 tab, 9 ref.

Descriptors: *Glaciohydrology, *Canada, *Discharge(Water), *Floods, Peak discharge, Lakes, Water levels, Glaciology.
Identifiers: *Jokullhlaups, Glacial outburst floods, Salmon Glacier(B C).

A record of two jokullhlaups, from Summit Lake, British Columbia, Canada, through Salmon Glacier was obtained from observations on falling lake levels, lake areas, and surface outflow, plus estimates of inflow. The rate of leakage through Salmon Glacier increased sharply with time, and seems related to the 3/2 power of the volume of water previously lost. The effective tunnel diameter in the ice at the end of the two jokullhlaups was 12.5-13 m. Development of a tunnel of this size by mechanical erosion is not in accord with the ratio of ice to water leaving the tunnel; instead enlargement by melting seems more likely. Only a part of the heat energy available from loss of hydraulic head seems to be needed to develop the tunnel. Water temperatures calculated for the overflow of the tunnel are, in general, consistent with this hypothesis. Sealing of the escape route for the water requires as little as 2 days. (See also W74-09325) (Knapp-USGS)
W74-09331

SUBGLACIAL LEAKAGE OF SUMMIT LAKE, BRITISH COLUMBIA, BY DYE DETERMINATIONS,
Department of the Environment, Ottawa (Ontario). Inland Water Branch.
D. Fisher.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 111-116, 1973. 3 fig, 2 tab, 10 ref.

Descriptors: *Glaciohydrology, *Canada, *Discharge(Water), *Floods, Peak discharge, Lakes, Water levels, Glaciology, Tracers, Dye releases.
Identifiers: Jokullhlaups, Glacial outburst floods, Salmon Glacier(B C).

Summit Lake, British Columbia, is dammed by Salmon Glacier and periodically drains catastrophically under the ice. In order to test for continuous leakage under the ice in the interval between the catastrophic discharges, fluorescent rhodamine dye was place in the lake. The dye was detected in the Salmon River below the glacier on each of three separate tests, and it was concluded that a continuous leak existed. From estimates of the velocity of the water, it was concluded that the water flowed along a plane approximately 2 mm thick. An explanation of the emptyings is related to the glacier's water content. (See also W74-09325) (Knapp-USGS)
W74-09332

SOME VIEWPOINTS ON THE INTERNAL DRAINAGE OF GLACIERS,
Uppsala Univ. (Sweden). Dept. of Physical Geography.
T. Stenborg.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 117-129, 1973. 7 fig, 22 ref.

Descriptors: *Glaciohydrology, *Melt water, *Ablation, Streamflow, Runoff, Drainage, Melting, Groundwater movement, Porous media.
Identifiers: *Internal drainage(Glaciers).

The superficial systems of oblique tensile crevasses on a glacier tongue will lead to a division of the drainage, which on the two glaciers studied, persists down to the frontal streams. The general possibilities and conditions for this model with two quite separate internal drainage systems are discussed in relation to the glaciers studied and with reference to similar glacier tongues in general. Some possibilities of drainage penetration are also discussed from a theoretical point of view. A general model involves the mutual influences of superficial and internal drainage, glacier movement and runoff. The beginning of the summer is characterized by some melting, small amounts of runoff, a high ice velocity influenced by the increasing storage of water in and under the glacier. Then the internal drainage develops under the influence of the frequent crevassing and wastage of the snow and superimposed ice that have blocked the old drainage courses superficially. Runoff often reaches its summer maximum at this time. From the further development of drainage courses, higher rates of runoff recession follow, the temporarily stored water is gradually drained, and the ice velocity decreases during the rest of the summer. (See also W74-09325) (Knapp-USGS)
W74-09333

GEYSER-LIKE WATER SPOUTS AT WERENSKIOLDBREEN, SPITSBERGEN,
Wrocfawski Univ. (Poland). Inst. of Geography.
S. Baranowski.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 131-133, 1973. 2 fig, 6 ref.

Descriptors: *Glaciohydrology, *Discharge(Water), Water pressure, Movement, Flow, Freezing, Melt water.
Identifiers: *Spitsbergen, Werenskioldbreen.

Enormous water spouts were observed on Werenskioldbreen, a glacier in Spitsbergen, at noon on July 28, 1957. They appeared in regular cycles resembling geyser water eruptions. Each cycle of nearly 3 min duration started with a strong burst of water (60 m in height), after which the next three or four increasingly smaller spouts occurred at intervals of 8-10 s. The water spouts were related to the rainfall and the strong ablation that had taken place during the previous night. Large volumes of water that ran off the glacier surface and penetrated to the glacier bed were probably dammed on their way to the snout of the glacier by the cold ice of the glacier peripheral zone. As a result of this, a subglacial lake with gradually increasing hydrostatic pressure was formed, the pressure eventually causing a crack. Part of the water was forced into the crack. Due to ice pressure, the fissure tended to close either at the base or near the surface of the glacier, thus causing the breaks in the spout of one cycle. (See also W74-09325) (Knapp-USGS)
W74-09334

CAN A WATER-FILLED CREVASSE REACH THE BOTTOM SURFACE OF A GLACIER,
Northwestern Univ., Evanston, Ill. Dept. of Materials Science.

J. Weertman.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 139-145, 1973. 6 fig, 7 ref, append.

Descriptors: *Glaciers, *Rheology, *Melt water, *Glaciohydrology, Creep, Deformation, Glaciology.
Identifiers: *Crevasses(Glacial).

A crevasse filled with water up at least 97.4% of its depth can penetrate to the bottom of a glacier. Water-filled cavities can exist directly beneath water filled crevasses. The pressure of water pushing against the walls of the crevasse acts as wedge force to cause further penetration into the glacier. (See also W74-09325) (Knapp-USGS)
W74-09335

GLACIAL ORIGIN OF PRO-GLACIAL BOULDERS,
Newcastle-upon-Tyne Univ. (England). Dept. of Geography.
H. Lister.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 151-155, 1973. 6 fig, 1 tab, 5 ref.

Descriptors: *Deposition(Sediments), *Sediment transport, *Glaciohydrology, Velocity, Melt water, Particle size, Boulders, Glaciers, Glacial sediments.
Identifiers: *Pro-glacial boulders.

The size of cobbles and boulders in pro-glacial streams indicates the stream velocity required to transport them. This velocity is generally greater than the existing channel shape can accommodate. Deposition of supraglacial debris is adequate explanation of the presence of these boulders only where adjacent to medical moraines. Subglacial deposition is the only apparent alternative. This progression is demonstrated by analysis of data from Vestspitsbergen and Sweden. Results indicate discrete, though temporary, subglacial channels. (See also W74-09325) (Knapp-USGS)
W74-09336

HYDROLOGY OF THE INTERGRANULAR VEINS IN A TEMPERATE GLACIER,
Bristol Univ. (England). H. W. Wills Physics Lab.
J. F. Nye, and F. C. Frank.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 157-161, 1973. 3 fig, 2 tab.

Descriptors: *Glaciohydrology, *Porous media, Pores, Saturated flow, Melt water, Permeability, Groundwater movement, Ice, Cryology, Leaching, Solutes.
Identifiers: *Intergranular veins(Glacial).

Pore space in glacial ice was analyzed by using surface-energy considerations together with measurements of dihedral angle. In pure polycrystalline ice in equilibrium at the melting point the water phase is situated in channels at three-grain intersections. The channels join together in fours at the four-grain intersections in tetrahedra having concave non-spherical faces. This implies that ice at the melting point is permeable to water. A temperature glacier is filled with a three-dimensional network of veins of water between the grains. The water flows downwards, replenished by melt water from the surface and by melt produced by heat of deformation within the glacier, at a rate that depends on the fractional volume occupied by the water. This can adjust itself to carry the flow supplied; kinematic waves with sharp shock fronts will therefore be possible. The most important function of the vein system may be that it provides an efficient means of flushing impurities into and out of the glacier. (See also W74-09325) (Knapp-USGS)
W74-09337

VELOCITY FLUCTUATIONS AND WATER REGIME OF ARCTIC VALLEY GLACIERS,
Axel Heiberg Expedition, Montreal (Quebec).
F. Muller, and A. Iken.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 165-182, 1973. 8 fig, 4 tab, 26 ref, append.

Descriptors: *Glaciers, *Movement, *Glaciohydrology, *Canada, Arctic, Melt water, Rheology, Ablation, Water balance, Temperature, Water circulation, Discharge(Water).

Surface movement, ablation and, to some extent, runoff were measured in the ablation are of cold valley glaciers, particularly White Glacier on Axel Heiberg Island (lat. 80% N.) in the Canadian Artic Archipelago from 1959 to 1969. The annual, seasonal and short-period velocity fluctuations were most strongly linked to the discharge capacity of the drainage system. However, changes in glacier thickness, ice temperature near the bed, and longitudinal stress gradient are also influential. Intraglacial, water-activated glide planes were observed. (See also W74-09325) (Knapp-USGS)
W74-09338

JERKY GLACIER MOTION AND MELT WATER,
Ohio State Univ., Research Foundation, Columbus. Inst. for Polar Studies.
R. P. Goldthwait.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 183-188, 1973. 2 fig, 1 tab, 12 ref.

Descriptors: *Glaciers, *Movement, *Melt water, Rheology, Faults(Geologic), Pores, Crystallography, Creep.

Jerky motion was found in 5 glaciers. Jerky quick-slip motion was found only in the upper surface of the ice. Instantaneous surface slips measured 0.1 to 15 mm and the intervals between measurable slips are 5 to 529 min. The magnitude of displacement increases with increased time interval. The mechanism causing these displacements seems to be fault slip where the shear stress exceeds the strength of less ductile surface ice. Longer-term velocities (0.2-50 mm/h) accelerate in long sunny periods or heavy rain periods and especially during the summer high-energy period. Motion at the bottom of temperate (Casement Glacier) or cold (Meserve Glacier) glaciers was smooth, not jerky, even where basal slip was the manner of displacement. Where there were jerky motions at the surface, they are somewhat more intense in late evening or early morning of bright or sunny days. Motion of this sort leads to the hypothesis that jerky surficial motion is caused by water development at crystal boundaries and pore-pressure changes akin to those now throught to produce earthquakes. (See also W74-09325) (Knapp-USGS)
W74-09339

WATER AT THE BED OF A GLACIER,
Bristol Univ. (England). H. W. Wills Physics Lab.
J. F. Nye.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 189-194, 1973. 3 fig, 8 ref, append.

Descriptors: *Glaciohydrology, *Erosion, Scour, Melt water, Freezing, Melting, Ice, Cryology, Discharge(Water).

The melt water at the bottom of a temperature glacier, or at the bottom of a cold glacier or ice sheet that has a temperature base, is in channels, rather than in a continuous film; a consideration of the relative permanence of these channels leads to the conclusion that, while there may be temporary channels incised upwards into the ice, there will be comparatively permanent channels cut downwards into the rock bed. (See also W74-09325) (Knapp-USGS)
W74-09340

SEASONAL VARIATIONS IN THE TRITIUM ACTIVITY OF RUN-OFF FROM AN ALPINE GLACIER (KESSELWANDFERNER, OETZTAL ALPS, AUSTRIA),
Innsbruck Univ. (Austria). Dept. of Physics.
W. Ambach, H. Eisner, and M. Url.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 199-204, 1973. 3 fig, 3 ref.

Descriptors: *Tracers, *Melt water, *Ablation, *Glaciohydrology, *Tritium, Firn, Snowmelt, Rainfall, Water balance, Ice, Springs, Radioactivity techniques.

Runoff water of a glacier consists of components of different origins: melted snow (in some cases firn layers deposited during previous years), melted old glacial ice, spring-water, and rain. Water from melted snow differs from that of old glacial ice in having comparatively high tritium values. For this reason, there is a significant decrease in radioactivity of melt water from the ablation area during the summer ablation period. Diurnal variations of activity were also measured. (See also W74-09325) (Knapp-USGS)
W74-09341

ON THE POSSIBILITY OF ARTIFICIAL CONTROL OF THE MASS BALANCE OF A PERENNIAL SNOW PATCH,
Nagoya Univ. (Japan). Water Research Lab.
K. Higuchi.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 207-212, 1973. 3 fig, 15 ref.

Descriptors: *Snowpacks, *Water balance, *Melting, Ablation, Glaciers, Glaciology, Insulation, Weather modification.
Identifiers: *Glaciers(Artificial).

A perennial snow patch develops during periods with much snow in winter and low temperature in summer and dissipates during periods with less snow and higher summer temperature. Therefore, a perennial snow patch would grow to a cirgue glacier if the accumulation could be increased and the ablation could be reduced when the dissipation of the snow patch would occur under natural climatic conditions. From field experiments it was concluded that sheets of polystyrene foam insulator were the best material to cover the snow surface in order to reduce melting. (See also W74-09325) (Knapp-USGS)
W74-09342

SIMPLE METHOD OF MEASURING THE AVERAGE AMOUNT OF WATER PRODUCED ANNUALLY BY MELTING OF ICE ON A GLACIER,
Water Survey of Canada, Ottawa (Ontario).
I. A. Reid, and W. S. B. Paterson.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge,

England: International Association of Scientific Hydrology Publication No 95, p 215-218, 1973. 1 fig, 4 ref.

Descriptors: *Ablation, *Melting, *Water balance, *Glaciers, *Glaciohydrology, Water yield, Melt water, Water storage, Ice, Water measurement.

In a glacier in a steady state, the amount of ice flowing through the cross-section at the equilibrium line in a year equals the total annual ablation in the ablation area. Also, at each point in the ablation area, the component of velocity perpendicular to the surface equals the thickness of ice lost in a year. These relations provide simple methods of estimating the average annual loss of ice from the ablation area. Data from Athabasca Glacier illustrate the methods. (See also W74-09325) (Knapp-USGS)
W74-09343

INFLUENCE OF CHANGES IN THE GLACIERZED AREA ON SUMMER RUN-OFF IN THE PORTE DU SCEX DRAINAGE BASIN OF THE RHONE,
Eidgenoessfische Technishe Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau und Erdbau.
P. Kasser.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 221-225, 1973. 4 fig, 1 tab, 6 ref.

Descriptors: *Glaciohydrology, *Runoff, *Melt water, Runoff forecasting, Temperature, Ablation, Water yield, Correlation analysis, Water balance, Hydrologic budget.
Identifiers: *Switzerland(Rhone River).

The glacierized area of the drainage basin of the Rhone represented 17.9% of the total area in 1876, 16.8% in 1916, 14.7% in 1955 and 13.6% in 1968. The influence of the change in the glacierized area on the runoff figures from April to September was demonstrated for the period 1915/55 by regression of the summer runoff figures on the winter precipitation, winter runoff, summer precipitation, summer temperatures and change of area. The partial coefficient of correlation for the change of area, r=0.384, is significant at level 98.9%. The regression coefficient of the change of area corresponds to a relationship of 10 degree days for the formation of 48 kg/sq m of water from melted ice, relative to the change of area, as against 55 kg/sq m obtained empirically from measurements on ablation stakes. The residuals of the regression equation, which takes no account of the change of area, shows a significant trend in the period 1916/68. This trend vanishes when the change of area is introduced as a variable or when its effect is eliminated by a relation between degree days and the formation of water from melted ice. (See also W74-09325) (Knapp-USGS)
W74-09344

ROLE OF ICE RUN-OFF IN THE WATER BALANCE OF THE MOUNTAIN AREA OF CENTRAL ASIA,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
I. D. Tsigel'naya.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 227-230, 1973. 1 fig, 2 tab, 6 ref.

Descriptors: *Runoff, *Ice, *Melt water, Water balance, Hydrologic budget, Glaciers, Glaciohydrology, Water yield, Asia.
Identifiers: *USSR(Central Asia).

The ice runoff resources of the mountain areas of Central Asia are as follows: Uzbek SSR, 2.1 cu km; Tajik SSR, 16.0 cu km; and Kirgiz SSR, 12.4 cu km. Precipitation was estimated by the annual isohyetal maps in the glacial-nival zone at the boundary of the glacier reservoir. The ablation at this glaciological level is equal to the accumulation. The proportion of the ice constituent in the total mountain runoff in Central Asia ranges from 5% to 83%, with an average of 25-32%. (See also W74-09325) (Knapp-USGS)
W74-09345

HYDROLOGICAL REGIME OF GLACIERS IN THE ALAY RANGE, CENTRAL ASIA,
Sredneasiatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. F. Suslov, and A. A. Akbarov.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 235-238, 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Glaciohydrology, Glaciation, Runoff, Melt water, Ice, Mountains, Water balance, Hydrologic budget, Snowmelt, Discharge(Water), Water yield, *Glaciers.
Identifiers: *USSR(Alay Range).

The main geographical regularity in the glacierization of the Alay range, USSR, is its gradual dimensional diminuation in a west to east direction. The altitude of the firn line and the location of glaciers increase in the same direction, while the vertical amplitude and degree of glacierization decrease. At the present time the areas of most of the glaciers in the Alay range are diminishing. A characteristic feature is the clear-cut relationship of all the glaciological and hydrological indices to the changing oroclimatic conditions within the range. The average total runoff from the glaciers of the Alay range is 33.2%. The proportion of runoff (derived from melting ice) in the annual river discharge is 16.8%. The proportion of melt water (derived from melting ice) in the rivers of the western part of the range is considerably smaller than in the rivers of the eastern part; this is explained by the greater amount of precipitation and later exposure of the surface of the glaciers from beneath the snow cover. The proportion of runoff from the melting of seasonal snow on the surface of glaciers decreases from west to east according to the precipitation decrease. The highest runoff from modulus of 0.085 cu m per sec has been observed in the western part of the range, whereas in its eastern part it may be as low as 0.018. The total discharge from the glaciers of the Alay range is 1.6 cu km, which is about 8% of the annual discharge of all the rivers of Central Asia. (See also W74-09325) (Knapp-USGS)
W74-09346

INFILTRATION AND RUN-OFF OF MELT WATER ON GLACIERS,
Institute of Geography, USSR Academy of Sciences, Moscow.
A. B. Bazhev.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 245-250, 1973. 2 fig, 2 tab.

Descriptors: *Melt water, *Infiltration, *Glaciohydrology, *Snowpacks, *Firn, Melting, Movement, Glaciology, Glaciers, Ice, Freezing.

Melt and rain-water infiltration into a firn pack was studied. In autumn at the beginning of snow accumulation a pit was dug and the old firn surface was marked with methyl dye. In spring before melting began, the pit was reopened and the pack structure was described in detail and its water content was evaluated by layers. This was done at regular intervals during the whole summer. Temperature changes were measured in an adjacent bore hole. From an average rate along the whole cross-section of 4.5 cm per day in the upper part, infiltration rate smoothly increases with depth reaching its maximum of 25 cm per day at the bottom of the snow pack. At the interface with the firn the rate sharply drops down almost to 2 cm per day. Deeper in the firn the rate curve has the nature of a sinusoid with an amplitude decreasing with depth. The curve of the change in the rate of infiltration front movement reflects the influence of two factors: cold storage and water content of the pack. Cold storage slows down the infiltration most in the upper part of the cross-section and its effect diminishes with depth. Water content suppresses the infiltration in the upper layers only slightly and in the lower ones to a much greater extent. Along with a rapid decrease of water permeability downward the infiltration rate becomes variable because of the occurrence of ice layers and lenses. Melt water on glaciers is not only the major source of warming the cold layers in the pack, but a considerable part remains in the firn in the liquid state until the autumn-winter freezing. At middle latitudes the layer of thick firn packs affected by infiltration processes is thicker, and they are more saturated with water. On the whole more melt water remains in a liquid state in winter at these latitutdes. The warmer the glacier regime, the greater the autumn-winter internal accumulation. (See also W74-09325) (Knapp-USGS)
W74-09347

ESTIMATION OF RUN-OFF FROM ANTARCTIC AND GREENLAND ICE SHEETS,
Akademiya Nauk SSSR, Moscow. Vsesoyuznyi Institut Nauchnoi i Teknicheskoi Informatsii.
K. S. Losev.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 253-254, 1973.

Descriptors: *Runoff, *Water balance, *Hydrologic budget, *Glaciers, *Antarctic, Icebergs, Glaciation, Glaciology.
Identifiers: *Greenland ice sheets.

The rate of calving the icebergs from the Antarctic ice sheet suggests that the estimates of ice loss which have been used in previous estimates of Antarctic mass balance are too low. A new estimate, based on three different methods, suggests that the combined output from Greenland and Antarctic ice sheets is more than 3000 cu km per year. The annual runoff from the Antarctic ice-sheet was calculated on the basis of mass balance, iceberg volume, and by comparison with Greenland. The three methods yield similar results. (See also W74-09325) (Knapp-USGS)
W74-09348

STRUCTURE AND INFERRED CIRCULATION OF SOUTH CASCADE LAKE, WASHINGTON, U.S.A.,
Geological Survey, Tacoma, Wash.
W. J. Campbell.
In: Proceedings of Symposium on the Hydrology of Glaciers, September 7-13, 1969, Cambridge, England: International Association of Scientific Hydrology Publication No 95, p 259-262, 1973. 3 fig, 2 ref.

Descriptors: *Limnology, *Thermal stratification, *Melt water, Lakes, Glaciers, Washington, Water circulation, Glaciohydrology, Water temperature.
Identifiers: *Washington(South Cascade Lake).

To elucidate the dynamic interplay between South Cascade Glacier and its terminal lake, a series of limnological measurements begun in 1966 include summer and winter profiles of temperature, oxygen concentration, and specific conductivity. In the summer, suspended sediment profiles were obtained, and the temperature structure of the epilimnion was measured in detail using thermistors, thermocouple probes, and infra-red

radiometers. In the summer an intense shallow epilimnion with a sharp thermocline is generated by the absorption of solar radiation by the highly turbid water. When this epilimnion persists throughout the summer the circulatory mode of the lake is dimictic; when it is transitory the mode is polymictic. In winter an inverse double thermocline is formed, with the oxygen-saturated glacier melt water flowing along the epilimnion at the ice bottom and out the lake, while the zone between the two thermoclines (10-30 m) is a region of slow return flow towards the glacier terminus or slow-moving convective cells. In the winter hypolimnion below 30 m depth apparently little motion occurs. (See also W74-09325) (Knapp-USGS)
W74-09349

CHLORIDE AND LEAD IN URBAN SNOW,
Department of the Environment, Ottawa (Ontario). Water Quality Div.
For primary bibliographic entry see Field 5B.
W74-09468

GREAT LAKES ICE COVER, WINTER 1971-72,
National Ocean Survey, Detroit, Mich.
R. A. Assel.
Available from NTIS, Springfield, Va. 22151 as COM-73-11746, Price $5.25 printed copy; $1.45 microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NOS LSC D 6, October 1972. 57 p, 46 fig, 2 tab.

Descriptors: *Ice cover, *Surveys, *Great Lakes, *Iced lakes, Lake Superior, Lake Huron, Lake Michigan, Lake Ontairo, Lake Erie, Lake ice, Aerial photography.

Ice cover was measured on the Great Lakes in the winter of 1971-72. Thirty-five ice charts were produced from data collected on 23 Lake Survey Center ice reconnaissance flights. In addition, five summary ice charts, illustrating ice distribution patterns for short intervals during the winter over the entire Great Lakes, were produced. The 1971-72 winter was severe on western Lake Superior and near normal throughout the remainder of the Great Lakes. Ice formation was reported November 10 in western Lake Superior at Duluth Harbor and along the perimeter of all the Great Lakes by the end of January. The period of maximum ice cover varied from the second week of February to the last week of March for individual lakes. During this time maximum ice cover was estimated to be as follows: Lakes Superior and Erie, 95%; Lake Michigan, 40%; Lake Huron, 70%; and Lake Ontario, 20%. Ice covers begin to decrease during March. Last reported ice ranged from May 5 for the lower lakes in the Niagara River to June 8 for the upper lakes in western Lake Superior. (Knapp-USGS)
W74-09588

AVALANCHE STUDIES IN THE SAN JUAN MOUNTAINS OF SOUTHWESTERN COLORADO,
Colorado Univ., Nederland. Inst. of Arctic and Alpine Research.
R. L. Armstrong.
Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201 - Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 44-51, 1973. 2 fig.

Descriptors: *Avalanches, *Snowpacks, Snow, Snow cover, Instrumentation, Mountains, Topography, Colorado, Weather, Meteorology, Temperature.
Identifiers: *San Juan Mountains(Colo).

The causes of snow avalanches in the San Juan Mountains of southwestern Colorado were studied to develop a forecast model to predict avalanche occurrence. In addition, the project was designed to evaluate the possibilities of increased avalanche activity which could result from winter cloud seeding activities. The terrain onto which snow is deposited influences the snow stability in many ways. In terms of surface characteristics only, the maximum instability will probably develop on smooth, grassy slopes while maximum stability will be found on heavily forested slopes. Surface features, such as boulders and forest cover, which are higher than the mean thickness of the snow cover act as an anchor; an avalanche will normally not occur until such time as snow depth exceeds the mean height of such closely spaced surface irregularities. Widely spaced or isolated obstacles have little stabilizing effect. It is generally considered that a basic correlation between slope angle and avalanche frequency does exist. While they do occur, avalanches are rare on slopes greater than 60 deg and less than 25 deg. A strong relationship exists between the amount and type of snow cover that develops within a particular slide path and the orientation of the ridge system associated with the slide path. The orientation of the ridge with respect to the wind direction during a given storm will determine to a considerable degree the precipitation pattern of that storm in terms of the local topography. With the aid of USGS maps, the orientation of both the slide paths and associated ridge systems, as well as mean angles of the slide paths were established for the study area. Fixed instrumentation was utilized to measure meteorological parameters, determine snowpack depth, density, and stratigraphy, and to detect avalanche events. (Knapp-USGS)
W74-09607

SNOW SAMPLING TECHNIQUES ON A SMALL SUBALPINE WATERSHED,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. R. Bartos, and P. A. Rechard.
Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201 - Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 52-61, 1973. 9 tab, 5 ref.

Descriptors: *Snow surveys, *Snowpacks, *Water equivalent, Water yield, Runoff forecasting, Streamflow forecasting, Sampling, Water measurement.

The study was located in the Nash Fork Basin of the Snowy Range in southeastern Wyoming. The research was conducted on a watershed of 744 acres at elevations ranging from 10,200 to 10,600 feet above mean sea level. The areal mean water equivalent of snow on a watershed can be determined more precisely, with little increase in effort, by a transect of many snow depth measurements and few snow density measurements. It is possible to develop a close estimate of the water equivalent on a small watershed by means of such a transect. When measuring depths independently of densities, the relative number of depth to density samples required on the subalpine watershed studied was 2:1 in forested cover and 5:1 in the open wind-influenced area for each elevation. (Knapp-USGS)
W74-09608

A COMPARISON OF TECHNIQUES OF SAMPLING THE ARCTIC-SUBARCTIC SNOWPACK IN ALASKA,
Soil Conservation Service, Anchorage, Alaska.
A. G. Crook, and T. G. Freeman.
Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201 - Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 62-68, 1973. 6 fig, 1 tab, 3 ref.

Descriptors: *Sampling, *Snow surveys, Water equivalent, Water yield, Stratigraphy, Snowpacks, Alaska.

Snowpack data are being gathered in Alaska by several procedures including CRREL observations and snow course surveys using Federal samplers. Values obtained by either method can be estimated using data from the other procedure. CRREL observations yield slightly higher density values than Bowman observations in light density snowpacks. The difference tends to diminish as density increases. Overmeasurement is a result, at least in part, of sampling strata of depth hoar crystals. Deeper snowpacks were characterized by higher densities and the fact that a smaller proportion of the profile has been metamorphosed to depth hoar crystals. The CRREL procedure overmeasure may be inversely proportional to density. The Bowman method offers a convenient, accurate, and reliable alternative for collecting snow depth and snow water equivalent and has a note-reduction procedure that allows for convenient onsite validity checks. The CRREL procedure gives a much more complete description of the stratigraphy of a snowpack. Onsite validity checks can be made most conveniently by routine replicate sampling within each horizon. Each procedure originated because of a specific need: CRREL to describe the profile and Bowman to determine water equivalent. Each is a well-suited method of collecting these data. (Knapp-USGS)
W74-09609

SNOW LOAD ANALYSIS AND RECREATIONAL USES OF SNOW DATA,
T. A. George, and D. W. McAndrew.
Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201 - Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 69-74, 1973. 6 fig, 12 ref.

Descriptors: *Snow surveys, *Winter sports, *Loads(Forces), Snowpacks, Recreation, Sampling, Ice loads, Snow cover.
Identifiers: *Snow loads.

In any deep snow zone area that is having or expects considerable urban development, there is a definite need for snow load data. If basic data are not available from existing snow courses, short-term snow courses throughout the elevation range could be established. After a few years of record, these short-term courses may be correlated to other similar courses in the region with longer periods of record, and be used to determine snow loads. When a specific site is being contemplated for a winter recreation area, it is desirable to install a few short-term snow courses for snowpack evaluation of the area. The short-term records collected while the proposed area is in the feasibility study period can be compared directly with long-term data, thereby giving the short-term snow courses more reliability and more meaning. (Knapp-USGS)
W74-09610

EVAPORATION LOSSES OF WINDBLOWN SNOW, AND THE POTENTIAL FOR RECOVERY,
Rocky Mountain Forest and Range Experiment Station, Laramie, Wyo.
For primary bibliographic entry see Field 2D.
W74-09611

MEAN PRECIPITATION AND SNOWFALL MAPS FOR A MOUNTAINOUS AREA OF POTENTIAL URBAN DEVELOPMENT,
Atmospheric Environment Service, Vancouver, (British Columbia).
D. G. Schaefer, and S. N. Nikleva.

Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201. Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 80-89, 1973. 6 fig, 3 tab, 4 ref.

Descriptors: *Snowfall, *Snow removal, *Urban hydrology, Planning, Cities, *Canada, Mapping, Precipitation(Atmospheric).
Identifiers: *Vancouver(BC).

As part of an environmental impact study, the climate of the mountainous areas north and west of Vancouver, Canada were studied to assess possible climatic limitations to urban development of the mountain slopes. A model of mean annual precipitation based upon available data and meteorological theory is presented. A mean annual snowfall map is derived in part from relationships between mean annual snowfall and mean annual precipitation at various altitudes. Implications for urban planning are discussed. (Knapp-USGS)
W74-09612

TELEMETERED PROFILING ISOTOPIC SNOW GAUGE: FINAL REPORT AND SPECIFICATIONS,
Aerojet Nuclear Co., Idaho Falls, Idaho.
P. D. Randolph, R. A. Coates, and E. W. Killian.
Available from NTIS, Springfield, Va 22151 as ANCR-1105 (TID-4500) Price $7.60 printed copy; $1.45 microfiche. Aerojet Nuclear Company Report ANCR-1105, April 1973. 123 p, 29 fig, 7 tab, 8 ref, 11 append. AEC Contract AT(10-1)-1375.

Descriptors: *Precipitation gages, *Snowpacks, *Telemetry, *Nuclear moisture meters, Water equivalent, Snowmelt, Data collections, Hydrologic data, Instrumentation.

A telemetered snow gage can be used to measure snow depth, snow density at one-half inch depth intervals through a snow pack, total water content, changes in water content, amount of new snow since last measurement, rainfall amount, and snow melt rate between measurements. It operates by measuring the attenuation by snow of gamma rays traveling a fixed distance between two vertical tubes. Four such gages are operated as a telemetered network from a central base station in Idaho. The base station uses a small data processor for gage control and data analysis. The field units are in Alaska, Oregon, Idaho and Colorado. Performance requirements are given for gage parts as well as complete mechanical and electronic drawings. A base station user's manual, a software description and a complete software listing are also includes. (Knapp-USGS)
W74-09757

2D. Evaporation and Transpiration

WATER LOSS ESTIMATES FROM A FALLOW SOIL,
South Dakota State Univ., Brookings. Dept. of Plant Sciences.
L. R. Stone, T. C. Olson, and M. L. Horton.
Journal of Soil and Water Conservation, Vol 28, No 3, p 122-124, May-June, 1973. 3 fig, 1 tab, 12 ref.

Descriptors: *Soil water movement, Soil moisture, Soil water, Fallowing, *Evapotranspiration, Percolation, Infiltration, Soils, Root zone, Hydraulic conductivity.
Identifiers: Hydraulic potential.

The magnitude and direction of soil water movement were determined daily for 50 days using tensiometers placed at eight depths in a fallow soil. Flux at the 150-centimeter (60-in) depth was determined using hydraulic potential data, unsaturated hydraulic conductivities, and soil-characteristic values. Daily evaporation rates were calculated as the difference between total water depletion in the 0- to 150-centimeter profile and water flux at the 150-centimeter depth. Flux at the 150-centimeter depth was downward throughout most of the 50-day period. This technique offers a means of determining water loss due to evaporation and percolation below the root zone in fallow soils. (Martino-NWWA)
W74-09546

EVAPORATION LOSSES OF WINDBLOWN SNOW, AND THE POTENTIAL FOR RECOVERY,
Rocky Mountain Forest and Range Experiment Station, Laramie, Wyo.
R. D. Tabler.
Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201. Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 75-79, 1973. 3 fig, 3 ref, append.

Descriptors: *Evaporation, *Snowpacks, *Colorado, *Sublimation, Snow, Winds, Snow management.

A method was developed to estimate annual sublimation from snowpacks. In low-growing sagebrush lands at 8,000 ft elevation along a highway study area, the average annual sublimation loss would be about 2,800 cu ft of water-equivalent per foot of width perpendicular to the wind, or about 224 ac-ft per sq mi--about 52% of the average winter's total precipitation. There can be little doubt that sublimation of blowing snow is a major component of the hydrologic cycle in such an area. Theoretically, all of the transport sublimation loss could be recovered if barriers were spaced sufficiently close to eliminate blowing snow completely. (Knapp-USGS)
W74-09611

ENERGY FLUX STUDIES IN A CONFIEROUS FOREST ECOSYSTEM,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
L. W. Gay.
Available from Sup Doc, GPO, Washington, DC 20402 Price $2.50. In: Proceedings of Conference on Research on Coniferous Forest Ecosystems, March 23-24, 1972, Bellingham, Wash: Forest Service Pacific Northwest Forest and Range Experiment Station, p 243-253, 1972. 3 fig, 1 tab, 21 ref. OWRR A-010-ORE(8).

Descriptors: *Forests, *Ecosystems, *Energy budget, Solar radiation, Evapotranspiration, Energy transfer, Convection, Albedo, Cloud cover.

The fluxes of thermal energy between the atmosphere and a young Douglas-fir forest were measured during two contrasting summer days, one cloudless and one overcast. The energy budget components were evaluated by the Bowen ratio method, with ceramic-wick psychrometers at the 26.16 m, 28.16 m, or 31.16 m levels. The maximum height of the tallest trees was 28 m, and the general level at the top of the closed canopy was about 22 m. Daily totals of the energy budget components (cal per sq cm) under cloudless skies on July 29, 1971, were: solar radiation, 584; net radiation, 410; change in storage, 5; convection, -135; and latent energy, -280. The albedo was 0.09 on both the clear and the overcast day. Analysis of the overcast conditions of July 31, 1971, yielded the following values: solar radiation, 171; net radiation, 134; change in storage, 6; convection, -39; and latent energy, -102. (Knapp-USGS)
W74-09615

2E. Streamflow and Runoff

HIGHWAYS AND THE CATASTROPHIC FLOODS OF 1972.
Highway Research Board, Washington, D.C.
Available from Highway Research Board, National Academy of Sciences, Washington, D.C. 20148, Price $2.20. Highway Research Record, No 479, 1973. 65 p.

Descriptors: *Floods, *Highways, *Design flood, *Disasters, Design, Risks, Conferences, Planning, Data collections, Flood data, Hydrologic data, Gaging stations, Damages.

Two conferences were devoted to the subject of the catastrophic floods that occurred in 1972 and the resulting impact on highway facilities. This material will be of interest to administrators, practicing engineers, and researchers interested in improving hydrologic analyses and hydraulic designs to minimize flood damage to transportation and other facilities. Not only did the record floods caused by Hurricane Agnes cause severe damage to highways in 1972, but numerous floods of significance occurred nationwide during the year. The papers presented discuss the hydrometeorological conditions associated with these floods and the part played by state and federal agencies in such emergencies. The comprehensive report on bridge damage due to Hurricane Agnes is included as a supplement to the proceedings. Debris was a primary cause or a significant contributing factor to bridge damage, and scour at the substructure was the other major cause. Other papers discuss recording, evaluating, and predicting extreme floods. A panel discussion on design criteria and the need for further research in such areas as improved methods of flood prediction and risk evaluation is included. (See W74-09391 thru W74-09400) (Knapp-USGS)
W74-09390

FLOODS OF 1972,
Geological Survey, Reston, Va.
D. M. Thomas.
Highway Research Record, No 479, p 1-4, 1973. 2 fig, 1 tab.

Descriptors: *Floods, *United States, Disasters, Historic floods, Flood data, Hurricanes, Storm runoff, Flood frequency, Dam failure, Seiches, Snowmelt, Weather, Meteorology.

During an average year floods in the U.S. claim about 100 lives and $1 billion in damage, but during 1972 the losses were four to five times that great. Although Hurricane Agnes caused severe fooding from North Carolina to New York, a variety of phenomena, including rainfall, snowmelt, ice jams, structural failures, and lake stages, caused flooding in Idaho, Washington, Oregon, Arizona, and other places. (See also W74-09390) (Knapp-USGS)
W74-09391

WEATHER SITUATIONS ASSOCIATED WITH FLOODS DURING 1972,
National Weather Service, Silver Spring, Md.
J. F. Miller.
Highway Research Record, No 479, p 5-11, 1973. 10 fig, 6 ref.

Descriptors: *Floods, *United States, Disasters, Historic floods, Flood data, Hurricanes, Storm runoff, Flood frequency, Dam failure, Seiches, Snowmelt, Weather, Meteorology, Weather.

Floods in the U.S. during 1972 resulted from a variety of meteorological causes, and some were only partially the result of extreme weather events. One flood that was not caused by a major weather event occurred on Buffalo Creek in West Virginia in February; and, although precipitation of moderate to heavy amounts occurred over a

fairly large area, the major flooding resulted primarily from dam failure. Of the other major flood events, one resulted from snowmelt during extremely warm periods, four resulted from isolated thunderstorm activity, three were the result of widespread precipitation associated with active frontal systems, one was the result of precipitation from a tropical storm, and one was the result of strong winds around the Great Lakes. (See also W74-09390) (Knapp-USGS)
W74-09392

HURRICANE AGNES-DAMAGE IN PENNSYLVANIA,
Pennsylvania State Dept. of Transportation, Harrisburg.
F. W. Bowser, and M. C. Tsai.
Highway Research Record, No 479, p 12-14, 1973.

Descriptors: *Floods, *Hurricanes, *Pennsylvania, *Damages, Historic floods, Highways, Bridges, Roads, Flood data.
Identifiers: *Hurricane Agnes(1972).

The Agnes flood levels of 1972 exceeded the previous record of 1936 by 3 to 6 ft in the Susquehanna River. At Wilkes-Barre, Pennsylvania, the river crested 18 ft above flood stage. The Schuylkill River in southeastern Pennsylvania crested at almost 17 ft above flood stage, which was 8 ft above the previous record set in 1902. In western Pennsylvania, the Allegheny, Monongahela, and Ohio Rivers crested at or near record levels. The overall damage from the June 1972 floods in Pennsylvania is estimated at more than $4 billion. Damage to roads, bridges, and other transportation facilities is estimated to exceed $100 million. (See also W74-09390) (Knapp-USGS)
W74-09393

FLOOD DAMAGE IN SOUTH DAKOTA,
South Dakota State Dept. of Highways, Pierre.
E. L. Rowen, and L. J. Harrison.
Highway Research Record, No 479, p 15-16, 1973. 1 tab.

Descriptors: *Historic floods, *Disasters, *South Dakota, Storm runoff, Cloudbursts, Damages, Bridges, Highways, Flood data.
Identifiers: Black Hills(SD).

South Dakota experienced its most devastating flood in history on June 9 and 10, 1972. This flood covered portions of Lawrence, Meade, Pennington, and Custer counties. The rain began at 5:00 p.m. on June 9 and continued until 2:00 a.m. on June 10 when it slowed to a drizzle that continued all day. Official reports on point rainfall accumulation show up to 14 in. covering about a 40-mile long by 15-mile wide area in the eastern Black Hills area. Two bridges were lost on the Interstate System, and emergency repairs were necessary on four others before traffic could be routed over them. Eighteen other bridges were completely destroyed on the state highway system. A total of 106 bridges were damaged or destroyed within the flood-ravaged area. (Knapp-USGS)
W74-09394

FLOODS IN MINNESOTA,
Minnesota State Highway Dept., Minneapolis.
J. E. Sandahl.
Highway Research Record, No 479, p 17-19, 1973. 2 tab.

Descriptors: *Floods, *Historic floods, *Minnesota, Damages, Highways, Bridges, Storm runoff, Flood data.

During the summer of 1972, Minnesota had rainfalls unprecedented in number, intensity, total rainfall, and area covered. The largest recorded storm in Minnesota history occurred on July 21, 1972, in central Minnesota. The storm was roughly 45 miles wide and 140 miles long, encompassing an area of 6,300 square miles. About 3,500 square miles or 55 persent of the storm area received a rainfall greater than 5 in. in the 8- to 10-hour storm duration; 178 square miles received more than 13 in. of rain. The storm caused the greatest monetary losses ever experienced in the state for a flash flood. Total damages are estimated at $20 million. Of this total, $5.9 million were damages to the road system. (See also W74-09390) (Knapp-USGS)
W74-09395

OBSERVATIONS ON THE CAUSES OF BRIDGE DAMAGE IN PENNSYLVANIA AND NEW YORK DUE TO HURRICANE AGNES,
Federal Highway Administration, Washington, D.C. Office of Engineering and Traffic Operations.
C. L. O'Donnell.
Highway Research Record, No 479, p 20-36, 1973. 24 fig, 3 ref.

Descriptors: *Floods, *Hurricanes, *New York, *Pennsylvania, *Bridges, Highways, Roads, Scour, Flood data, Bridge design, Historic floods.
Identifiers: Susquehanna River, Chemung River.

Hurricane Agnes (1972) caused severe flooding in Pennsylvania and New York. Several bridges and highways that were damaged by the floods in those states are discussed. The two major causes of bridge damage were scour at abutments and poers and impacting debris. Although the June 1972 flood was a maximum of record, many bridges survived the flood with little if any damage. These bridges were of particular interest because they obviously have features that enabled the structures to survive a severe test. The outstanding performance of these structures is a positive indication of features that constitute desirable design standards. A pile foundation of sufficient length or footings founded at a sufficient depth are needed to avoid abutment or pier failure in erodible soils. The amount of scour at bridge abutments and piers failure in erodible soils. The amount of scour at bridge abutments and piers within the bridge opening depended primarily on the amount of construction that the bridge opening imposed on the flood flow. Abutments and piers positioned near the edges of the main channel generally suffered extensive scour damage. The outstanding performance of spur dikes during the June 1972 floods clearly demonstrated that they are one of the most effective means now available for preventing scour damage to bridge approaches, abutments, and adjacent piers in situations involving large quantities of overbank flow. (See also W74-09390) (Knapp-USGS)
W74-09396

RECORDING FLOODS AND FLOOD DAMAGE,
Geological Survey, Reston Va.
For primary bibliographic entry see Field 4A.
W74-09397

PROBABILITY DISTRIBUTION OF EXTREME FLOODS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W74-09398

THE WORTH OF DATA IN HYDROLOGIC DESIGN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-09399

DESIGN CRITERIA AND RESEARCH NEEDS,
Hydrologic Engineering Center, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09400

FLOOD SURVEY AT PROPOSED TAPS CROSSING OF YUKON RIVER NEAR STEVENS VILLAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4C.
W74-09405

DISCHARGE COEFFICIENTS OF FLOAT-AREA-TYPE FLOW METERS,
Tokyo Science Univ. (Japan).
H. Maki.
Bulletin of the JSME (Japan Society of Mechanical Engineers), Vol 17, No 103, p 83-87, January, 1974. 6 fig, 1 tab, 8 ref.

Descriptors: *Flow measurement, *Instrumentation, *Reynolds number, *Mathematical studies, Flow rates, Application methods.
Identifiers: *Discharge coefficient.

The commonly used discharge coefficients of float-area-type flow meters do not always have constant values over a wide range of characteristic Reynolds numbers. Floats having special shapes or geometrical dimensions have constant value discharge coefficients. A semi-empirical formula to predict flow rate characteristics has been obtained and limits of applicability of this formula are explained. (Sandoski-FIRL)
W74-09480

CALIBRATION OF U.S. GEOLOGICAL SURVEY RAINFALL/RUNOFF MODEL FOR PEAK FLOW SYNTHESIS--NATURAL BASINS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W74-09603

A GENERAL PURPOSE EVENT WATER-LEVEL RECORDER,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 7B.
W74-09604

WATER--A PRIMER,
California Univ., Berkeley.
For primary bibliographic entry see Field 2A.
W74-09613

RIVER REGULATIONS AS INFLUENCE ON PEAK DISCHARGE,
International Engineering Co., Inc., Denver, Colo. Barton, Stoddard, Milhollin and Higgins Div.
For primary bibliographic entry see Field 4A.
W74-09617

COMPARISON OF FOUR NUMERICAL METHODS FOR FLOOD ROUTING,
Hydraulics Research Station, Wallingford, (England).
R. K. Price.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10659, p 879-899, July 1974. 4 fig, 2 tab, 18 ref, 7 append.

Descriptors: *Flood routing, *Numerical analysis, Routing, Flood waves, Waves(Water), Finite element analysis, Unsteady flow, Mathematical models.

The accuracy and efficiency of four of the more important numerical methods for flood routing were compared by simulating the propagation of the monoclinal wave in two channels with different bottom slopes. The implicit method of Amein is in general the most suitable method for routing floods in rivers of small slope. In addition, the implicit method has maximum accuracy when the ratio of the space and time steps is approxi-

mately equal to the flood wave speed. These conlusions are not necessarily valid for flooding in estuaries. The methods examined were Leap-Frog explicit method, two step Lax-Wendroff explicit method, four-point implicit method of Amein, and fixed mesh characteristic method. (Knapp-USGS)
W74-09621

DESKTOP COMPUTER FLOW ROUTING,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 8B.
W74-09626

MULTIPLE LINEARIZATION FLOW ROUTING MODEL,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 8B.
W74-09627

SIMULATION ACCURACIES OF GRADUALLY VARIED FLOW,
Montreal Engineering Co. Co. Ltd. (Quebec).
For primary bibliographic entry see Field 8B.
W74-09628

NEW DATA ON WATER CIRCULATION IN THE ARCTIC BASIN (NOVYYE DANNYYE O TSIRKULYATSII VOD ARKTICHESKOGO BASSEYNA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
A. F. Treshnikov, and G. I. Baranov.
Akademiya Nauk SSSR Doklady, Vol 207, No 3, p 702-705, 1972. 1 fig, 11 ref.

Descriptors: *Oceanography, *Ocean circulation, *Ocean currents, *Arctic, *Arctic Ocean, Winds, Eddies, Topography, Depth.
Identifiers: USSR, Hydrosphere, Countercurrents, Isobaths(Oceanography).

Circulation within the hydrosphere is one of the most important mechanisms of redistribution of heat transported to Earth and, in turn, released by Earth into space. Flow of water in the Arctic Basin is one of the links in total water circulation in the hydrosphere. Its importance, however, is not limited to this fact, since variations in circulation of surface waters of the Arctic Basin largely control variations in ice conditions in seas bordering the Arctic and, hence, navigation conditions on Arctic Sea routes. There is a close correlation of hydrologic fields over the entire depth of the ocean. Present investigations of water circulation in the Arctic Basin were based upon a theory of stationary thermohaline circulation as the internal form of movement in the ocean. All components of a geostrophic current were calculated in 1955-56 from known wind and water-density fields, and a diagram of deep circulation in the Arctic Basin was constructed. A developed region of anticyclonic circulation and a large transarctic current were observed in the surface layer. A two-layer circulation was observed in the Eurasian subbasin where bottom waters flow in a direction opposite to that of surface waters and Atlantic waters, and a three-layer circulation develops in the Canada Basin where surface and bottom waters form an anticyclonic circulation, and Atlantic waters form a cyclonic countercurrent. (Josefson-USGS)
W74-09649

TEMPERATURE AND SALINITY STATISTICS OF SURFACE WATERS OF THE ATLANTIC OCEAN (STATISTIKA TEMPERATURY I SOLENOSTI POVERKHNOSTI ATLANTIKI),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 2K.
W74-09650

USE OF BASE-RUNOFF RECESSION CURVES TO DETERMINE AREAL TRANSMISSIVITIES IN THE UPPER POTOMAC RIVER BASIN,
Geological Survey, Albuquerque, N. Mex.
F. W. Trainer, and F. A. Watkins, Jr.
Journal of Research, U.S. Geological Survey, Vol 2, No 1, p 123, 125-131, January-February, 1974. 2 fig, 1 tab, 17 ref.

Descriptors: *Potomac River, *Streamflow, *Data collections, *Transmissivity, *Recession curves, *Hydrogeology, Aquifer characteristics, Storage coefficient, Groundwater basins, Runoff.

The recession curve of base runoff is used in geohydrologic study of the upper Potomac River basin. The slope of the recession curve is used with other data to estimate average basin values for transmissivity from streamflow data. Two general recession curves characterize the tributary basins: (1) A continuous (simple) curve approximately straight on a semilogarithmic plot, which represents a constant set of diffusivity values within a basin and (2) a discontinuous (compound) curve, composed of a steeper first segment and a gentler second segment. Simple curves represent basins underlain by sandstone, shale, or crystalline rock; by combinations of these rocks; or by carbonate rock. Compound curves, which represent basins underlain in part by carbonate rock and in part by noncarbonate rock, are believed to reflect seasonal changes in relative discharge of these unlike aquifers, with the carbonate rock providing most of the ground-water runoff during summer-autumn and during drought. (Sandoski-FIRL=)
W74-09740

2F. Groundwater

THE PRODUCTION, FLOW AND DISTRIBUTION OF MELT WATER IN A GLACIER TREATED AS A POROUS MEDIUM,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W74-09326

GLACIER DISCHARGE SIMULATION BY GROUND-WATER ANALOGUE,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2C.
W74-09327

GROUND-WATER DATA, 1972, INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-09352

HYDROGEOLOGY OF THE FORMATION AND NEUTRALIZATION OF ACID WATERS DRAINING FROM UNDERGROUND COAL MINES OF WESTERN MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 5B.
W74-09369

WATER-TABLE FLUCTUATION IN RESPONSE TO RECHARGE,
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR2, Paper 10582, p 117-125, June 1974. 2 fig, 10 ref, append.

Descriptors: *Recharge, *Water level fluctuations, *Water spreading, Groundwater, Equations, Irrigation, Water table, Surface-groundwater relationships.

Analytical expressions were developed to describe the rise and fall of the water table in an extensive unconfined aquifer receiving localized vertical recharge and discharging into a surface reservoir in which the water level remains equal to that of the main flow before recharge. The rate of recharge is maintained by a spreading area in the form of an infinitely long strip of finite width. The solutions are expressed in terms of the head averaged over the depth of saturation. They are applicable when the rise of the water table is smaller than 50% of the initial depth of saturation. A numerical example is presented. (Knapp-USGS)
W74-09409

A CENTRIFUGAL TECHNIQUE FOR RAPIDLY ESTIMATING THE PERMEABILITY OF A CONSOLIDATED SANDSTONE,
Birmingham Univ. (England). Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 8E.
W74-09527

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-09543

PROBLEMS RELATED TO THE EVALUATION OF GROUNDWATER RESOURCES OF THE CRYSTALLINE ROCK AREA, SAN DIEGO COUNTY, CALIFORNIA,
California State Univ., San Diego. Dept. of Geology.
W. J. Ganus.
In: Studies on the Geology and Geologic Hazards of the Greater San Diego Area, California, Ross, A. and Dowlen, R. J., eds., San Diego Association of Geologists, 1973. p 111-118.

Descriptors: *Crystalline rocks, Discharge, Recharge, Pump testing, Runoff, *California.

Methods of evaluating regional groundwater systems in crystalline rocks are discussed. Traditional methods of evaluation, based on rigid analytical models, that assume homogeneous and isotropic materials are ineffective in most crystalline terrains. More realistic evaluations can be obtained using methods based on projections of surface observations, water budget analysis, and pump test. A procedure for conducting pump tests in crystalline reservoirs is outlined and the results of several tests are discussed. Areas of recharge and discharge in a typical crystalline terrain are identified. Finally, the nature and extent of the storage and transmitting material is discussed, and a new model is presented to represent groundwater systems in fractured crystalline rocks. (Martino-NWWA)
W74-09544

GROUNDWATER POLLUTION.
For primary bibliographic entry see Field 5B.
W74-09590

THE EFFECT OF AN ARTIFICIAL LAKE DEVELOPMENT COMPLEX ON THE GROUNDWATER SYSTEM,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-09591

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
Eastern New Mexico Univ., Portales. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-09596

HYDRAULIC TESTING AND SAMPLING OF HOLES RB-E-01 AND RB-D-01, PROJECT RIO BLANCO, RIO BLANCO COUNTY, COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 4B.
W74-09601

WATER--A PRIMER,
California Univ., Berkeley.
For primary bibliographic entry see Field 2A.
W74-09613

OPTIMAL PUMPING FOR AQUIFER DEWATERING,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-09620

OUTLINE OF THE HYDROGEOLOGY OF SIBERIA (OCHERKI PO GIDROGEOLOGII SIBIRI).
Institut Zemnoi Kory, Irkutsk (USSR).
Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, Novosibirsk, 1973. 140 p.

Descriptors: *Investigations, *Hydrogeology, *Groundwater, *Groundwater resources, Groundwater basins, Groundwater movement, Aquifers, Water wells, Water supply, Water utilization, Water types, Mineral water, Brines, Lakes, Springs, Structural geology, Water chemistry, Inorganic compounds, Water quality, Mineralogy.
Identifiers: *USSR(Siberia), Soviet Far East, Mineralization, Spas, Balneology.

Water-bearing formations in different geologic and geocryologic conditions, and groundwater resources of fold mountain regions in East Siberia are described. Prospects of groundwater use for water supply of the Irkutsk Oblast are discussed, and attention is focused on problems relating to formation of different types of groundwater and mineral surface waters, their isotopic composition, and to hydrogeologic investigations in Siberia and Soviet Far East. (See W74-09642 thru W74-09647)
W74-09641

SUBSURFACE FLOW INTO LAKE BAYKAL BASIN (PODZEMNYY STOK BASSEYNA OZ. BAYKAL),
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 2H.
W74-09642

PRESENT STATE AND PROSPECTS OF GROUNDWATER USE FOR WATER SUPPLY OF POPULATED AREAS IN IRKUTSK OBLAST (SOSTOYANIYE I PERSPEKITIVY ISPOL'ZOVANIYA PODZEMNYKH VOD DLYA VODOSNABZHENIYA OBZHITOY CHASTI IRKUTSKOY OBLASTI),
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 4B.
W74-09643

PROBLEMS OF HYDROGEOLOGIC INVESTIGATIONS IN THE EASTERN PART OF THE USSR IN 1971-75 (ZADACHI GIDROGEOLOGICHESKIKH ISSLEDOVANIY NA VOSTOKE SSSR NA 1971-1975 GG),
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 4B.
W74-09647

2G. Water In Soils

ECOLOGICAL INVESTIGATION OF EUBACTERIA AND ACTINOMYCETES IN AQUATIC AND TERRESTRIAL BIOTOPES OF CROATIA (IN SERBO-CROATIAN),
Institut za Botaniku, Zagreb (Yugoslavia).
For primary bibliographic entry see Field 5B.
W74-09351

CALCULATION OF NATURAL CATCHMENT INFILTRATION BY COMPUTER,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 7C.
W74-09367

WASTEWATER AND SOIL INTERACTION,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W74-09425

SOIL CLOGGING DURING INFILTRATION OF SECONDARY EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-09467

DISTRIBUTION OF MOISTURE IN THE UNSATURATED SOIL PROFILE ON A PIEDMONT WATERSHED,
Clemson Univ. Clemson, S.C. Dept. of Agricultural Engineering.
J. T. Ligon, and T. V. Wilson.
Transactions of the ASAE (American Society of Agricultural Engineering), Vol 16, No 6, p 1100-1103, November-December, 1973. 15 fig, 6 ref. OWRR A-023-SC(5).

Descriptors: *Soil profiles, *Moisture content, *Watersheds(Basins), Soil moisture, Surface runoff, Precipitation(Atmospheric), Subsurface runoff, Seepage, Root zones, Groundwater, *South Carolina, *Soil moisture.
Identifiers: *Clemson Research Watershed(SC).

The distribution of moisture was investigated in the unsaturated soil profile of a 0.21 acre plot within a 28.4 acre watershed of the 561 acre Clemson Research Watershed in the Piedmont area. Intensive measurements were made of soil moisture to a depth of 32 ft along with measurement of precipitation, surface runoff and interflow to provide some indications of the nature of the deep seepage groundwater recharge phenomenon in this region. It is apparent that downward seepage below the zone of root influence is a continuous process but that the rate of transfer at a point increases rapidly with increased moisture content. At this particular site, where the water table occurs at a depth of 60-65 ft, there is a considerable lag between the occurrence of excess moisture at hthe soil surface and groundwater recharge resulting from this excess. The extent of this time lag is a function of initial soil moisture due to the strong dependence of unsaturated conductivity upon moisture content. (Merritt-FIRL)
W74-09518

WATER LOSS ESTIMATES FROM A FALLOW SOIL,
South Dakota State Univ., Brookings. Dept. of Plant Sciences.
For primary bibliographic entry see Field 2D.
W74-09546

CALCULATION OF SOIL HYDRAULIC CONDUCTIVITY FROM SOIL-WATER RETENTION RELATIONSHIPS,
Battelle-Pacific Northwest Lab., Richland, Wash. Dept. of Water and Land Resources.
A. E. Reisenauer.
Available from NTIS, Springfield, Va. 22151 as BNWL-1710 - Price $4.00 printed copy; $1.45 microfiche. Report BNWL-1710, 1973. 27 p, 13 fig, 1 tab, 14 ref, 2 append. AEC Contract AT(45-1)-2130.

Descriptors: *Computer programs, *Hydraulic conductivity, *Soil water movement, Soil moisture, Equations, Retention, Moisture tension.
Identifiers: *Millington and Quirk equation, Moisture suction.

To compute hydraulic conductivity of partially saturated soil, a computer program was written to solve the modified Millington and Quirk equation. The equation uses moisture retention and suction measurements. The equation and computer programs are discussed. Plots of test results are compared with physically measured data. (Knapp-USGS)
W74-09599

CLOUD SEEDING FOR SNOW AUGMENTATION: LAND USE RAMIFICATIONS OF RESIDUAL SILVER IODIDE NUCLEATING AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-09606

THE UNIQUENESS OF THE MOISTURE CHARACTERISTICS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
A. Poulovassilis.
Journal of Soil Science, Vol 25, No 1, p 27-33, March 1974. 3 fig, 10 ref.

Descriptors: *Soil water movement, *Wetting, *Unsteady flow, Moisture Content, Moisture tension, Hysteresis, Unsaturated flow, Saturated flow.

The relationship between moisture content and suction in porous materials during transient flow conditions was tested. When a vertical column of sand was brought to uniform moisture content and uniform suction in a draining condition by percolating a constant flow through it until apparent equilibrium conditions ensued and then placed horizontally at the same time as the flow was stopped, the suction decreased with time over a period of a day, indicating that the sand was wetting. This decrease was smaller, the drier the sand. However, when the column was left in a vertical position with the water percolating through it for three hours after apparent equilibrium conditions were reached, a small adjustment of moisture content and suction was observed; when it was then placed horizontally as in the previous experiments, little decrease of suction was observed. No change in suction was observed in either case if the equilibrium condition was reached in a wetting porous material. These experimental results are explained by the hypothesis that, during drainage, some water is left in pores from which the air-water interface has already retreated to drain through film flow, more slowly, subsequently to the continuous water body. Additional experiments showed that the release of entrapped air may have a small effect on the uniqueness of the moisture characteristics. (Knapp-USGS)
W74-09625

STORAGE OF MANURE SOLIDS BY FORMING SOIL-MANURE PELLETS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.

W74-09679

CONTRIBUTION OF ANIMAL WASTE TO NITRATE NITROGEN IN SOIL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5B.
W74-09697

HEAVY MANURE APPLICATIONS: BENEFIT OR WASTE,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 5D.
W74-09698

EFFECTS OF SOLID BEEF FEEDLOT WASTES ON SOIL CONDITIONS AND PLANT GROWTH,
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 5D.
W74-09699

DRAINAGE INVESTIGATIONS AND FINDINGS ON THE GOTVAND PROJECT - IRAN,
Harza Engineering Co., Chicago, Ill.
P. Jacobsen.
Paper No 72-703 presented at Winter Meeting of the American Society of Agriculture Engineers, December 11-15, 1972. Chicago, Illinois. 7 p, 3 fig, 2 tab, 3 ref.

Descriptors: *Draina164*Surface drainage, *Subsurface drainage, Tile drainage, Soil water, Salinity, Water table.
Identifiers: *Iran.

In the spring of 1972 a special drainage investigation, which included soil analyses and permeability studies, was made on the Gotvand Project in Iran. As a result, drainage recommendations were made for specific areas and a monitoring system was proposed that would indicate the need for additional drainage before land damage can occur. (Skogerboe-ColoradoState)
W74-09797

2H. Lakes

REPORT ON GREAT LAKES WATER QUALITY FOR 1972.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5G.
W74-09257

IMPERMANENT LAKES,
D. Brunsden, and J. C. Doornkamp.
Geographical Magazine, Vol 44, p 393-397, (1973). 6 fig.

Descriptors: *Lake(Inflow), *Discharge(Water), *Bodies of water, *Morphology, Sediments, Glaciers, Lake basins, Lake stages, Artificial lakes, VEOLUME(Sediment-water interfaces, Watersheds, Catchment basin, Evaporation, Water law, Lake shores.
Identifiers: *Tectonic lakes.

The impermanence of lakes is examined. Lakes, regarded as constantly changing natural systems, may be manmade or natural systems; they are generally formed under special but varied conditions such as glacial erosion, downwarping of the earth's crust, and the presence of barriers across river valleys. Rain and groundwater are collected onto the water surface itself or onto the lakes' catchment areas. The catchments supply sediment to the lake which, if it does not possess a vigorous outlet, may be rapidly infilled by course deltaic deposits near the incoming stream mouths, or silts and clays in deeper water or near the lake exit. If very little sediment leaves the storage basin it is possible to estimate the volume of silt on a lake floor and thereby obtain a measure of the rate of erosion of the catchment area. Some lakes may change prmanently when the primary cause for their presence disappears, such as retreating glaciers, out-flowing rivers cutting below the level of the lowest point in the lake basin, or the filling of the lakes with sediments. Lakes can also be drained by man, or tectonic tilting. The importance of lakes in the more recent history of the earth's surface is discussed. (Proctor-Florida)
W74-09261

SUBGLACIAL LEAKAGE OF SUMMIT LAKE, BRITISH COLUMBIA, BY DYE DETERMINATIONS,
Department of the Environment, Ottawa (Ontario). Inland Water Branch.
For primary bibliographic entry see Field 2C.
W74-09332

STRUCTURE AND INFERRED CIRCULATION OF SOUTH CASCADE LAKE, WASHINGTON, U.S.A.,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W74-09349

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
Available from NTIS, Springfield, Va 22151 as Com-73-10913, Price $3.00 printed copy; $1.45 microfiche. International Field Year for the Great Lakes Bulletin No 3, May 1972. 86 p.

Descriptors: *Great Lakes, *Limnology, *Data collections, *United States, *Canada, Data processing, Hydrology, Water chemistry, Fisheries, Instrumentation.
Identifiers: *International Field Year for the Great Lakes.

Status and results of both the U.S. and Canadian programs in the International Field Year for the Great Lakes are reviewed in relation to the Joint (U.S.:Canadian) Technical Plan. Aspects reviewed are: instruments and observing systems, data management, taxonomy of plankton, fishery survey, buoy system measurements, and water chemistry. (Knapp-USGS)
W74-09350

INTERNATIONAL FIELD WORK FOR THE GREAT LAKES.
Available from NTIS, Springfield, Va. 22151, as COM-73-11097, Price $5.75 printed copy; $1.45 microfiche. International Field Year for the Great Lakes, Bulletin No 6, April 1973. 67 p, J. Sandilands, F. Jenkins and M. Laughrum, editors.

Descriptors: *Lake Ontario, *International Hydrological Decade, *Great Lakes, Limnology, Plankton, Meteorology, Waves(Water), Data collections.
Identifiers: *International Field Year for the Great Lakes.

Canadian IFYGL work on Lake Ontario includes studies of zooplankton, phytoplankton biomass and species composition, wind and temperature fluctuations, meteorological buoy measurements, and wave climatology of the lake. Information is also given on the U.S. scientific programs of data acquisitions systems and data management. References to recent papers and reports of interest to participants are included. (Knapp-USGS)
W74-09372

LAKE ONTARIO HYDRAULIC MODEL STUDY (PRELIMINARY RESULTS),
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
R. R. Rumer, Jr., K. Kiser, and C. Y. Li.
Available from NTIS, Springfield, Va. 22151 as COM-73-10724 Price $3.00 printed copy; 0.95 microfiche. NOAA Sea Grant 2-35281.

Descriptors: *Model studies, *Water circulation, *Lake Ontario, Seiches, Winds, Currents(Water), *Hydraulic models, Hydraulic similitude, Great Lakes.

The response of Lake Ontario to wind stress at the free surface, thermal stratification, and the major inflow and outflow was studied using a physical model. The model is rotated to incorporate the Coriolis force. The experiments include a study of seiche damping in the model of Lake Ontario, a study of the circulation pattern resulting from the inflow of the Niagara River and the outflow of the St. Lawrence River, and a study of the circulation resulting from a superposed, steady westerly wind. The electrolytic technique for generating a neutrally buoyant colored tracer is the primary technique. For seiche decay, boundary friction in the model is reasonably simulated for the main basin but exaggerated in the shallow entrance region to the St. Lawrence River. The observed period and frictional dissipation of the uninodal seiche were strongly influenced by this shallow region north of Main Duck Island. The electrolytic technique for observing water movement is highly satisfactory. (Knapp-USGS)
W74-09402

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION: VOLUME 7. EARTHQUAKE HISTORY AND MEASUREMENT WITH APPLICATION TO THE LAKE MICHIGAN DRAINAGE BASIN,
Argonne National Lab., Ill.
R. B. Keener.
Available from NTIS, Springfield, Va. 22151 as ANL/ES-40, Vol. 7, Price $4.00 printed copy; $1.45 microfiche. Report ANL/ES-40, Vol 7, February 1974. 19 p, 2 fig, 2 tab, 22 ref. AEC Contract W-31-109-ENG-38.

Descriptors: *Earthquakes, *Risks, *Great Lakes Region, *Lake Michigan, Engineering geology, Seismic design, Seismology.

Seismicity of the Lake Michigan Basin is described, covering earthquakes with a maximum felt intensity as small as II. Earthquakes which have taken place outside of the Basin but were felt within it are tabulated also. Major earthquake risk areas of the United States are discussed, and a brief inventory of a few of the major earthquakes that occurred or have otherwise been felt in the country is given. The methods of measuring and categorizing seismic events are reviewed. A short section regarding theories of earthquake prediction is included. (Knapp-USGS)
W74-09407

BENTHOPHILUS STELLATUS (SAUVAGE) IN THE KUIBYSHEV RESERVOIR (IN RUSSIAN),
F. K. Gavlena.
Vopr Ikhtiol, Vol 13, No 1, p 174-175, 1973.
Identifiers: *Benthophilus-stellatus, Reservoirs, *USSR(Kuibyshev reservoir), Aquatic animals.

B. stellatus, a member of the Black Sea-Caspian faunal complex that adapted to freshwater life in the Upper Tertiary, has become a new element of the fish fauna of the Kuibyshev reservoir and Volga basin (USSR).--Copyright 1974, Biological Abstracts, Inc.
W74-09433

PHOSPHORUS STUDIES IN LOWER GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Madison. Dept. of Water Chemistry.
For primary bibliographic entry see Field 5C.
W74-09435

FULL-SCALE HARVEST OF AQUATIC PLANTS: NUTRIENT REMOVAL FROM A EUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W74-09438

CONTENT AND COMPOSITION OF PLANT PIGMENTS IN THE RYBINSK RESERVOIR (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. A. Elizarova.
Gidrobiol Zh, Vol 9, No 2, p 23-33, 1973, Illus, English summary.
Identifiers: Carotenoids, *Chlorophyll, *Phytoplankton, *Pigments(Plants), Reservoirs, *USSR(Rybinsk reservoir).

Three peaks in the plant pigments concentration in the waters of Rybinskoya (USSR) reservoir are noted (June, Aug., Sept.), that coincide with the periods of the most intense phytoplankton development. Vertical distribution of pigments in the spring and autumn is rather even; a summer peak in chlorophyll a concentration within upper 2 m water layer, and chlorophyll c in the bottom layer is noted. Average chlorophyll content for the study period was in limits 3.5 to 9 for chlorophyll a, 0.4 to 1.0 for chlorophyll b, 1.4 to 2 mcg/l for chlorophyll c, and 3.7 to 7.0 mSPU/l for carotenoids. The correlation carotenoids/chlorophyll a was calculated. This value changes during the vegetation period, and depends on the phytoplankton composition and its physiological state.--Copyright 1974, Biological Abstracts, Inc.
W74-09446

PHILOMETRA LUSIANA FROM FISHES OF THE KREMENCHUG RESERVOIR, USSR, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
V. P. Bachinski, and N. F. Gomonenko.
Parazitologiya, Vol 7, No 3, p 293-294, 1973, English summary.
Identifiers: *Philometra-lusiana, Reservoirs, *USSR(Kremenchug reservoir), *Fish parasites.

P. lusiana which was previously known only from pond fisheries, was recorded from fishes of natural waters. An increase in the infection rate of fishes with P. lusiana in the Kremenchug reservoir shows that conditions prevailing in natural waters are favorable for the completion of the life cycle of this parasite.--Copyright 1974, Biological Abstracts, Inc.
W74-09449

FORMATION OF THE BENTHOS OF THE RUZ RESERVOIR IN THE FIRST YEARS OF ITS EXISTENCE (1966-1967), (IN RUSSIAN),
E. V. Pastukhova.
Biol Vnutr Vod Inf Byull. 15. p 25-29. 1972.
Identifiers: *Benthos formation, *Chironomus-plumosus, Reservoirs, *USSR(Ruz river reservoir).

A river-bed type reservoir with a length of 35 km, width 1 km, area 33 km3, and average depth 7 m was created on the Ruz river (tributary of the Moscow river (USSR)) in 1965. Data on the formation of the benthos in the river bed and submerged floodplain of the river are presented on the basis of regular observations at 33 stations during the ice-free period of 1966-1967. The ususal successive impoverishment of the species composition of the benthos in reservoirs after mass reproduction of chironomids, mainly Chironomus plumosus, was noted; and in the 2nd year there was a decline of the population and biomass of the benthos.--Copyright 1974, Biological Abstracts, Inc.
W74-09507

ON THE CHARACTERIZATION OF THE PARASITE FAUNA OF YELLOW PERCH (PERCA FLUVIATILIS L.) IN FIVE LAKES, IN SOUTHERN ONTARIO, CANADA,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-09541

GREAT LAKES ICE COVER, WINTER 1971-72,
National Ocean Survey, Detroit, Mich.
For primary bibliographic entry see Field 2C.
W74-09588

SUBSURFACE FLOW INTO LAKE BAYKAL BASIN (PODZEMNYY STOK BASSEYNA OZ. BAYKAL),
Institut Zemnoi Kory, Irkutsk (USSR).
B. I. Pisarskiy.
In: Ocherki po gidrogeologii Sibiri; Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, p 43-52, Novosibirsk, 1973. 7 tab.

Descriptors: *Lakes, *Lake basins, *Subsurface flow, *Groundwater movement, *Surface-groundwater relationships, Streamflow, Discharge(Water), Springs, Water types, Rivers, Underflow, Groundwater resources, Fractures(Geologic), Rocks.
Identifiers: *USSR(Lake Baykal), Tectonics.

Subsurface flow into Lake Baykal consists of (1) groundwater contribution to streamflow; (2) underchannel flow; and (3) deep inflow of cold and thermal waters along fracture zones. Groundwater contribution to streamflow is the major part of the natural groundwater resources and is 18,210 million cu m/yr or 1.1 liters/sec/sq km. The role of underchannel flow and of flow through fracture zones is negligible. The rate of underflow is estimated at 1,030 million cu m/yr. Deep flow through fracture zones in the area of the lake cannot be directly measured. Excess of outflow from the basin over inflow is 2,680 million cu m/yr. On the basis of calculations, total natural groundwater resources in Lake Baykal basin are estimated at 20,890 million cu m/yr, and the average rate of subsurface flow is 1.26 liters/sec/sq/km. (See also W74-09641) (Josefson-USGS)
W74-09642

MINERAL LAKES OF TUVA (MINERAL'NYYE OZERA TUVY),
Institut Zemnoi Kory, Irkutsk (USSR).
A. I. Krutikova, and Yu. I. Kustov.
In: Ocherki po gidrogeologii Sibiri; Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, p 113-117, Novosibirsk, 1973. 1 fig, 2 tab.

Descriptors: *Water chemistry, *Water quality, *Lakes, *Mineral water, Salts, Carbonates, Sulfates, Brines, Water temperature, Trace elements, Lake morphometry.
Identifiers: *USSR(Tuva ASSR), Mineral springs, Balneology, Mineralization.

The Tuva Autonomous Republic has many mineral lakes of varying composition and mineralization. Water-surface areas of the lakes are generally small (0.5-5.0 sq km) except for Lake Khadyn (23.6 sq km) and Lake Ubsu-Nur (3,350 sq km), which borders on the Mongolian People's Republic. Depth of the lakes varies between 0.3 and 3.4 m, occasionally reaching 10 m or more (Lake Khadyn). The thickness of mud deposits is 0.3-1.0 m and, in places, 1.5 m. The dissolved-salts content in the lakes varies between 2 and 340 g/liters and the water temperature, between 15 and 28 deg C. Distribution of 11 mineral lakes in central Tuva is mapped, and chemical composition of 6 mineral lakes and trace-element composition of 10 mineral lakes are tabulated. Use of natural brine of the lakes is recommended for balneological and industrial purposes. (See also W74-09641) (Josefson-USGS)
W74-09646

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER QUALITY MANAGEMENT ON LAKE ERIE: YEAR TWO,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 5G.
W74-09653

LIMNOLOGICAL STUDIES OF LAKE JACOMO, JACKSON COUNTY, MISSOURI. II. THE DYNAMICS OF THE MACROBENTHOS AND ITS RELATIONSHIP TO WATER QUALITY AND PLANKTON DISTRIBUTION IN LAKES JACOMO AND PRAIRIE LEE, WITH A NOTE ON THE SPORT FISHERY, 1971-1972,
Missouri Univ., Kansas City. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-09660

SURFACE SEDIMENTS IN HAMANA LAKE, THE PACIFIC COAST OF CENTRAL JAPAN,
Shizuoka Univ. (Japan). Faculty of Science.
I. Noriyuki, and T. Handa.
Rep Fac Sci Shizuoka Univ. 7 p 129-148, 1972, Illus.
Identifiers: Coast, Composition, *Japan(Hamana Lake), Lakes, Pacific Ocean, Sediments, *Zostera-Marina, *Lake sediments.

A grain-size analysis was made on the surface sediments of Hamana Lake, Japan with sieving and pipette methods. The sediments were divided into 3 major types. Distributions of Phi-Median, Sigma-Phi and Alpha-Phi are calculated from the cumulative curves and discussed in relation to the hydraulic condition of the lake. Sand which is distributed in the southern part of the lake is probably supplied by the tide currents from the open sea. Silt which occupies northern half of the lake originates from the suspension mainly supplied by terrestrial water. Sediments sustaining Zostera marina are characterized by the well sorted sand with approximately 30% mud content in 3-4 m water. Z. nana is found in low salinity areas with sediments of gravel-bearing sand and silt.--Copyright 1973, Biological Abstracts, Inc.
W74-09751

AN INFORMATION SYSTEM FOR THE MANAGEMENT OF LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
H. D. Reynolds.
Available from NTIS, Springfield, Va, 22151 as COM-73-11249, Price $5.50 printed copy, $1.45 microfiche. New York State Sea Grant Program, Great Lakes Management Problems Series, May 1973, 190 p, 7 fig, 9 tab, 77 ref.

Descriptors: *Information exchange, *Lake Ontario, *Information retrieval, Data storage and retrieval, Water management(Applied), International Joint Commission, Planning, Data collections, Great Lakes, Canada, United States.

An information system is proposed for the management of Lake Ontario. It should be effectively and efficiently responsive to the needs of the users, considering the purposes to be served and the types and amounts of information required to serve these purposes. The study provides a logical procedure for identifying information users, needs, sources, and implications for the nature of the information system and provides a basis for case studies. The case studies illustrate this procedure in a detailed manner. The information system being considered will not only serve the Experimental Operations Office in carrying out its management and planning tasks, it will also serve as a means to carry out the much needed task of providing coordination of information collection, storage, and dissemination among all parties in Canada and the United States concerned with water resources. (Knapp-USGS)
W74-09752

LEAD, CD, ZN, CU, AND CO IN STREAMS AND LAKE WATERS OF CAYUGA LAKE BASIN, NEW YORK.
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-09762

PARTICULATE LEAD CONTAMINATION RECORDED IN SEDIMENTARY CORES FROM LAKE WASHINGTON, SEATTLE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W74-09791

2I. Water In Plants

VASCULAR PLANT SURVEY OF MARSH AND ADJACENT HIGHLAND IN SELECTED PORTIONS OF COOPER RIVER AND WANDO RIVER,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 2L.
W74-09382

THE VEGETATION OF THE COOPER RIVER ESTUARY,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 2L.
W74-09383

EFFICIENCY OF FUNCTIONING OF THE MAIN ECOSYSTEMS OF THE EUROPEAN FOREST-STEPPE, (IN RUSSIAN),
A. M. Grin, Yu. L. Rauner, and V. D. Utekhin.
Dokl Inst Geogr Sib Dal'Nego Vostoka. 33. p 45-50. 1972.
Identifiers: *Ecosystems, *Europe(Forest-steppe), Moisture, *Productivity, Solar radiation, *Biota, USSR(Kursch).

The biological productivity of ecosystems depends on the efficiency of utilizing the material and energy resources of the environment (solar radiation, moisture, etc.) by the biota. The efficiency is determined by the internal structure of the biota. It is suggested to distinguish 2 aspects of the structure: edification and adaptive. The edification structure determines the uptake of the environmental resources by the ecosystem and the adaptive structure determines the completeness of their utilization by the biota. Indexes are presented of the utilization of radiation and moisture in the main ecosystems of the forest-steppe in the region of Kursch (USSR) forest, steppe and agricultural (field). The edification and adaptive structures of the plant part of the biota (phytobiota) in these associations are described and the significance of the characteristics of the structure for efficient operation of the ecosystem is considered.--Copyright (c) 1974, Biological Abstracts, Inc.
W74-09500

STUDIES ON TREMATODE PARASITES OF LUCKOW (INDIA): I,
Lucknow Univ. (India). Dept. of Zoology.
K. C. Pandey.
Indian J Zootomy, Vol 11 No 3, p 145-148. Illus. 1970(1972).
Identifiers: *India(Lucknow), New, Orientocreadium-bactrachoides, Phyllodistomum-vachius, *Tetracotyle-lali, *Trematodes, *Fish parasites, New species.

A new stregeid metacercaria, Tetracotyle lali is described. Variations in Orientocreadium batrachoides Tubangui, 1931 and Phyllodistomum vachius Dayal, 1949 are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-09530

GROWTH OF SUBIRRIGATED JAPANESE HOLLY AS AFFECTED BY SOIL TYPE AND DEPTH,
Georgia Univ., Athens. Dept. of Horticulture.
S. I. Patel, and J. H. Tinga.
Hortscience, Vol 8, No 1, p 27-28, 1973, Illus.
Identifiers: Cultivars, *Growth rates, Ilex-crenata, *Japanese holly, Rotundifolia, Soil types, *Irrigation.

Container-grown plants of Japanese holly (Ilex crenata Thumb. cv. 'Rotundifolia') were grown satisfactorily using subirrigation for 90 days during July-Sept. With either sandy loam or clay loam soil at a depth of 20 or 30 cm on a constant water level pan, soil moisture level remains near optimum in the root zone.--Copyright 1973, Biological Abstracts, Inc.
W74-09600

ENERGY FLUX STUDIES IN A CONFIEROUS FOREST ECOSYSTEM,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 2D.
W74-09615

AN INITIAL EVALUATION OF ETHYLENE OXIDE FOR THE STERILIZATION OF FORMULATED AND PELLETED FISH FEEDS,
Victoria Univ. (British Columbia). Dept. of Bacteriology and Biochemistry.
T. J. Trust, and A. J. Wood.
J Fish Res Board Can. Vol 30, No 2, p 269-274, 1973.
Identifiers: *Bacterial studies, Ethylene oxide, *Fish food, Growth rate, Infection, Salmo-gairdneri, Sterilization, *Juvenile fish, *Trout.

Satisfactory sterilization (to deter bacterial infection) of dried pelleted fish foods was achieved with an ethylene oxide-carbon dioxide gas mixture (20:80). The growth rates of juvenile rainbow trout (Salmo gairdneri) fed on feed so sterilized were comparable to or better than those of trout fed the same feed not sterilized.--Copyright 1973, Biological Abstracts, Inc.
W74-09723

MUSSELS OF THE ELK RIVER BASIN IN ALABAMA AND TENNESSEE: 1965-1967,
Tennesse Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
B. G. Isom, P. Yokley, Jr., and C. H. Gooch.
Am Midland Nat., Vol 89, No 2, p 437-442. 1973.
Identifiers: *Alabama, Dysnomia-biemarginata, *Elk River(Ala-Tenn), Fusconaia-cuneolus, Fusconaia-edgariana, Lastena-lata, Lexingtonia-dolabelloides, *Mussles, Quadrula-intermedia, *Tennessee, River basins.

Extensive collections of mussels were made in the Elk River basin during 1965-1967. Thirty species of mussels not previously reported for this drainage were collected in addition to 18 spp. reported by Ortmann (1925). Twenty-six Cumberlandian and 35 spp. of Ohioan or unknown origin comprise the total mussel fauna reported for Elk River. Species of Cumberlandian origin reported by Ortmann have declined and species usually associated with larger rivers have increased. Tims Ford Dam (closed Dec. 1970) will, undoubtedly, significantly affect the mussel fauna of Elk River. Endangered mussel species in the portion of the Elk River covered by this study include Fusconaia cuneolus, F. edgariana, Quadrula intermedia, Lexingtonia dolabelloides, Lastena lata and Dysnomia biemarginata.--Copyright 1973, Biological Abstracts, Inc.
W74-09737

DYNAMICS OF FOREST, MEADOW AND SWAMP VEGETATION IN CONNECTION WITH RECLAMATION (BASED ON STUDIES IN BELORUSSIA), (IN BYELORUSSIAN),
I. D. Yurkyevich, L. P. Smolyak, and V. I. Parfyunaw.
Vyestsi Akad Navuk B Ssr Syer Biyal Navuk. 5. p 5-10, 1972.
Identifiers: Forests, Meadows, *Plant communities, *Productivity, Reclamation, Succession, Swamps, *USSR(Byelorussia), *Vegetation.

Results of a study of the succession of plant communities as a function of the degree and duration of reclamation and its effect on productivity are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-09746

DYNAMICS OF THE VEGETATION OF THE SANDS OF THE ANCIENT AND PRESENT DELTA OF THE SYR-DAR'YA RIVER,
F. N. Chalidze.
Ekologia. Vol 3, No 6, p 48-51, 1972.
Identifiers: *Deltas, Moisture, Rivers, Sands, *USSR(Syo-Darya delta), *Vegetation.

The series of plant communities of the sands of the Syr-Dar'ya delta are described in relation to variations of the groundwater level, development of the alluvial process, and moisture conditions and formation of deposits of different mechanical composition related with them. The possibility of indicating individual phases of these changes on the basis of the vegetational cover is shown.--Copyright 1973, Biological Abstracts, Inc.
W74-09750

2J. Erosion and Sedimentation

GLACIAL ORIGIN OF PRO-GLACIAL BOULDERS,
Newcastle-upon-Tyne Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W74-09336

WATER AT THE BED OF A GLACIER,
Bristol Univ. (England). H. W. Wills Physics Lab.
For primary bibliographic entry see Field 2C.
W74-09340

TIDAL CURRENTS, SEDIMENT TRANSPORT, AND SAND BANKS IN CHESAPEAKE BAY ENTRANCE, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-09368

CHARLESTON AREA SEDIMENT SAMPLES,
South Carolina Pollution Control Authority, Columbia.
For primary bibliographic entry see Field 5A.
W74-09386

SEISMIC PROFILES, COOPER RIVER.
For primary bibliographic entry see Field 2L.
W74-09388

HYDROGRAPHIC FRAMEWORK OF THE DOBOY SOUND ESTUARY AND SURVEYS OF THE OTHER TIDAL INLETS ALONG THE COAST OF GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2L.
W74-09582

AN EXPERIMENTAL STUDY OF DRAINAGE BASIN EVOLUTION AND THE INFLUENCE OF LANDFORMS ON HYDROLOGIC VARIABLES,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-09586

DEVELOPMENT OF THE TURBIDITY MAXIMUM IN A COASTAL PLAIN ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-09587

AVALANCHE STUDIES IN THE SAN JUAN MOUNTAINS OF SOUTHWESTERN COLORADO,
Colorado Univ., Nederland. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W74-09607

INFLUENCE OF SUCTION AND BLOWING ON ENTRAINMENT OF SAND PARTICLES,
Waterloopkundig Laboratorium, Delft (Netherlands).
D. M. Oldenziel, and W. E. Brink.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10672, p 935-949, July 1974. 11 fig, 3 tab, 18 ref, 2 append.

Descriptors: *Bed load, *Porous media, *Sediment transport, Shear stress, Particle size, Pore water, Alluvial channels, Hydraulic models, Groundwater movement.

An upward flow of water through a porous sand bed reduces the apparent weight of the sand particles and therefore their stability. This effect increases the rate of transport. From literature it is known however, that upward flow also reduces the flow velocity near the bed and the bed shear stress, which decreases the rate of transport. The predominating effect depends on the flow conditions in and above the bed. Downward flow gives opposite effects. Both aspects were examined and the theoretical relations were compared with the results of experiments that were carried out in the Delft Hydraulics Laboratory. For the range of grain sizes studied, downward flow always decreased the rate of sand transport whereas upward flow increased this rate. The grain size of the transported particles was greater than that of the bed particles. This effect was enhanced with downward flow and was less pronounced for upward flow. (Knapp-USGS)
W74-09616

ESTIMATION OF WASHLOAD PRODUCED ON CERTAIN SMALL WATERSHEDS,
New York State Univ., Buffalo. Dept. of Civil Engineering.
O. Rendon-Herrero.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10638, p 835-848, July 1974. 10 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Sediment yield, *Suspended load, *Unit hydrographs, *Hydrograph analysis, Land use, Storm runoff, Overland flow, Sediment discharge, Small watersheds, *Pennsylvania.
Identifiers: *Bixler Run(Pa).

To predict suspended load production on small watersheds, a method is presented that is analogous to the unit-hydrograph method. The ordinates of a sediment discharge graph are divided by the excess runoff that mobilized it, producing a unit sediment discharge graph. For many storm events, unit sediment discharge graphs are generated that vary considerably in peak value and shape. The ordinates of the graphs are then plotted logarithmically against their respective excess runoff, yielding data points that can be fitted by straight lines. Estimation of the sediment discharge or of a sediment discharge graph for a given excess runoff can therefore be accomplished. Bixler Run Watershed, Pa., 15 sq miles in area, was used as a data source. Granulometric tests disclosed that the suspended sediment in Bixler Run is predominately washload. (Knapp-USGS)
W74-09618

STOCHASTIC ANALYSIS OF DUNE BED PROFILES,
Harza Engineering Co., Chicago, Ill. Water Resources Planning Div.
B. K. Lee, and H. E. Jobson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10657, p 849-867, July 1974. 8 fig, 5 tab, 15 ref, 2 append.

Descriptors: *Bed load, *Channel morphology, *Dunes, Profiles, Flumes, Hydraulic models, Stochastic processes, Sand waves, Sediment transport, Statistics, Dispersion, Probability.

Application of stochastic models of bed-load transport and dispersion requires a knowledge of the probability distributions of the step lengths and the rest periods of the particles. The probability distributions of the rest periods, the elevation of particle deposition, and the elevation of particle erosion were obtained in a large flume from a continuous record of bed elevation at a fixed point as a continuous function of time. The probability distribution of the step lengths was obtained from a series of instantaneous longitudinal bed profiles and the distribution of the elevation of particle deposition and erosion. Using an existing transport equation, the total sediment transport in the flume was predicted for three flow conditions. The errors in the predicted total sediment transport rates were -3.0%, +3.5%, and +80.1%. (Knapp-USGS)
W74-09619

VARIATION IN WIDTH-DISCHARGE RELATION AND SOME IMPLICATIONS FOR HYDRAULIC GEOMETRY,
Sheffield Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W74-09632

STUDIES OF THE SEASONAL VARIATION OF THE SUSPENDED MATTER OF THE MENAI STRAITS. II. MID STREAM DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W74-09741

SURFACE SEDIMENTS IN HAMANA LAKE, THE PACIFIC COAST OF CENTRAL JAPAN,
Shizuoka Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 2H.
W74-09751

OCCURRENCE OF LI, B, CU, AND ZN IN SOME EGYPTIAN NILE SEDIMENTS,
Goettingen Univ. (West Germany). Sediment-Petrographisches Institut.
For primary bibliographic entry see Field 5B.
W74-09779

PARTICULATE LEAD CONTAMINATION RECORDED IN SEDIMENTARY CORES FROM LAKE WASHINGTON, SEATTLE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W74-09791

2K. Chemical Processes

LASER RAMAN SPECTROSCOPY OF SOLUTES DISSOLVED IN WATER FROM A REMOTE PLATFORM,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-09255

CHEMICAL SURVEY OF WATERS ADJACENT TO COLONELS ISLAND, GLYNN COUNTY, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W74-09584

GEOLOGY AND QUALITY OF WATER IN THE MODESTO-MERCED AREA, SAN JOAQUIN VALLEY, CALIFORNIA, WITH A BRIEF SECTION ON HYDROLOGY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W74-09605

PRESENT STATE AND PROSPECTS OF USE OF THERAPEUTIC MINERAL WATERS IN THE IRKUTSK OBLAST (SOSTOYANIYE I PERSPEKTIVY ISPOL'ZOVANIYA LECHEBNYKH MINERAL'NYKH VOD IRKUTSKOY OBLASTI),
Institut Zemnoi Kory, Irkutsk (USSR).
V. F. Kaurov, Ye. V. Pinneker, and P. I. Trofimuk.
In: Ocherki po gidrogeologii Sibiri; Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, p 58-64, Novosibirsk, 1973.

Descriptors: *Water chemistry, *Water quality, *Mineral water, Salts, Chlorides, Sulfates, Water types, Saline water, Brines, Springs, Water wells, Water utilization, Human population.
Identifiers: *USSR(Irkutsk Oblast), Mineral springs, Spas, Balneology, Hydropathy, Mineralization.

The Irkutsk Oblast has an abundance of therapeutic waters which vary in degree of mineralization, composition, and temperature. The vast Angara-Lena Basin on the Siberian Platform contains therapeutic brines and saline waters. Thermal, carbonic acid, and radon waters are found in mountains of eastern Sayan and the Baykal uplands. Brines of deep horizons are of calcium- or sodium-chloride types and contain such balneologically active components as hydrogen sulfide, bromine, and radon. Sodium-chloride, calcium-chloride, calcium-sulfate, and sodium-sulfate waters occur at relatively shallow depths (100-700 m). About 250 springs and wells containing therapeutic mineral waters have been discovered in the Oblast. Only three spas in the Oblast are presently using mineral waters. Local sanatoriums can today accommodate 1,250 persons out of a population of about 2.5 million. When completed, the 'Novoye Usol'ye spa will increase total accomodations to 1,800, a figure considerably lower than 1970 requirements (4,000-4,500). Based on a projected population of 2.8 million by 1975, sanatoriums will soon have to provide facilities for 5,000 persons. Problems in the use of mineral waters in the Oblast in 1971-80 include: (1) expansion and reconstruction of existing spas; (2) elimination of strong hydrogen-sulfide brines near Novonukutsk village for construction of a large spa; (3) organization of new regional sanatoriums; (4) construction of hydropathic establishments for treatment of diseases in almost all administrative centers in the Oblast; and (5) construction of mineral-water bottling plants. Consideration must be given to construction of a locality around Lake Baykal for exploitation of the region's hydromineral resources. (See also W74-09641) (Josefson-USGS)
W74-09644

MINERAL WATERS OF NILOVAYA PUSTYN', THEIR REGIME AND RESOURCES (MINERAL'NYYE VODY NILOVOY PUSTYNI, IKH REZHIM I RESURSY),
Institut Zemnoi Kory, Irkutsk (USSR).
I. M. Borisenko.
In: Ocherki po gidrogeologii Sibiri; Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, p 107-112, Novosibirsk, 1973. 3 tab.

Descriptors: *Water chemistry, *Water quality, *Mineral water, Salts, Springs, Thermal water, Gases, Hydrogeology, Structural geology.
Identifiers: USSR(Buryat ASSR), Balneology, Mineralization, *USSR(Nilovaya Pustyn').

Mineral waters of Nilovaya Pustyn' discharge in the valley of the Ikhe-Ukhgun' River (tributary of the Irkut), 7 km north of Turan village, Tunkinskiy Rayon, Buryat ASSR. The chemical composition of the waters is of the sodium-sulfate type with a mineralization of 1 g/liter. On the basis of data of detailed explorations in 1967, the rate of discharge of mineral waters was found to be 1,816 cu m/day. The mineral waters are characterized as thermal with a constant temperature (40-42 deg C). Mineral waters of Nilovaya Pustyn' are widely used in the Irkutsk Oblast, Buryat Assr and other regions. The waters have a very therapeutic effect in the treatment of many diseases. The high therapeutic properties of the mineral waters should provide an impetus for establishment of a large spa at Nilovaya Pustyn'. (See also W74-09641) (Josefson-USGS)
W74-09645

ANTIMONY IN GROUNDWATER OF THE KADAMDZHAY DEPOSIT (SUR'MA V PODZEMNYKH VODAKH KADAMDZHAYSKOGO MESTOROZHDENIYA),
Tomsk Polytechnic Inst. (USSR).
For primary bibliographic entry see Field 4B.
W74-09648

TEMPERATURE AND SALINITY STATISTICS OF SURFACE WATERS OF THE ATLANTIC OCEAN (STATISTIKA TEMPERATURY I SOLENOSTI POVERKHNOSTI ATLANTIKI),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
Ye. G. Agafonava, and A. S. Monin.
Akademiya Nauk SSSR Doklady, Vol 207, No 3, p 586-588, 1972. 1 fig, 1 ref.

Descriptors: *Atlantic Ocean, *Surface waters, *Salinity, *Temperature, *Statistical methods, Correlation analysis, Regression analysis.
Identifiers: USSR, Probability density, Probability distribution.

Natural relations between heating, cooling, evaporation, precipitation, and horizontal and vertical movements of water create a specific statistical relation between temperature and salinity of ocean water. This statistical relation is a distict characteristic of both ocean and world climates. The most complete description of this statistical relation is the two-dimensional probability density p (S,T), where S is salinity and T is temperature of ocean water. This function can be used to describe the thermodynamic state of the world ocean and to compare climates of individual seas. The function was derived for surface waters of the Atlantic on the basis of data gathered by the Instiute of Oceanology of the USSR Academy of Sciences. These data encompass 80% of all data accumulated throughout the world during the last 100 years. For the Atlantic, these data cover about 70,000 stations, 90% of which relate to the period 1925-65. Most observations were conducted north of 40 deg North Latitude and mainly in summer. (Josefson-USGS)
W74-09650

AQUA REGIA FOR QUANTITATIVE RECOVERY OF MERCURIC SULFIDE FROM SEDIMENTS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5A.
W74-09763

A NEW VANADYL (IV) THIOCYANATE METHOD FOR THE SPECTROPHOTOMETRIC DETERMINATION OF VANADIUM (IV),
Andhra Univ., Waltair (India). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-09765

QUANTITATIVE SEPARATION OF MAGNESIUM AND PALLADIUM FROM NUMEROUS METAL IONS ON TITANIUM TUNGSTATE PAPERS BY ELECTROCHROMATOGRAPHY,
Aligarh Muslim Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-09782

2L. Estuaries

FLORIDA'S SEAWARD BOUNDARIES--A DILEMMA,
Miami Univ., Fla. Ocean Law Program.
For primary bibliographic entry see Field 6E.
W74-09281

PROTECTING AMERICA'S ESTUARIES: FLORIDA (PART 2).
For primary bibliographic entry see Field 5G.
W74-09283

THIBODAUX PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 6E.
W74-09288

RECENT FEDERAL LEGISLATION SIGNIFICANT IN ENVIRONMENTAL PLANNING PROGRAMS OF THE STATE OF TEXAS.
Texas Law Inst. of Coastal and Marine Resources, Houston.
For primary bibliographic entry see Field 6E.
W74-09316

ENVIRONMENTAL CONSIDERATIONS FOR WATER MANAGEMENT DISTRICT 6 OF COLLIER COUNTY,
Collier County Conservancy, Inc., Naples, Fla.
For primary bibliographic entry see Field 6B.
W74-09360

EFFECTS OF SALINITY AND SUSPENDED SEDIMENT ON TURBULENT DIFFUSION OF POLLUTANT IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-09362

TIDAL CURRENTS, SEDIMENT TRANSPORT, AND SAND BANKS IN CHESAPEAKE BAY ENTRANCE, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
J. C. Ludwick.
Technical Report No 16, November 15, 1973. 13 p, 4 fig, 1 tab, 14 ref. ONR-GP Contract N00014-70-C-0083.

Descriptors: *Sediment transport, *Estuaries, *Chesapeake Bay, Currents(Water), Tides, Sedimentary structures, Sands, *Virginia.

The mean of tidal current measurements at ebb and flood strength in the entrance of Chesapeake Bay are nearly equal at 42 cm/sec. At individual stations, ebb maximum is 79 cm/sec; flood maximum is 66 cm/sec; however, at more than half the observation stations, maximum flood speed and duration exceed maximum ebb speed and duration. At 19 of 24 stations, ebb-directed sediment transport exceeds flood-directed sediment transport. Much of the longer flood is incompetent and the greater ebb shear stress more than offsets larger flood speeds. Net sediment transport is directed landwards only in parts of channels and in dead-end sinuses which are re-entrant into shoals and open to flood currents. In the Chesapeake Bay entrance net sediment transport at the headlands is directed seaward. Individual shoals within the entrance are bounded on one side by a net sediment transport to seaward and on the other side by a net sediment transport to landward. Ebb deltas and flood deltas occur in alternate succession across the entrance. There is also an interior flood delta found where ebb-directed sediment is interdicted and swept landwards in a flood-dominated channel. (Knapp-USGS)
W74-09368

THE COOPER RIVER ENVIRONMENTAL STUDY.
South Carolina Water Resources Commission State Water Plan Report No 117, April 1974. 164 p.

Descriptors: *Estuaries, *South Carolina, *Saline water intrusion, *Flow control, Path of pollutants, Stratified flow, Streamflow, Discharge(Water).
Identifiers: *Cooper River(SC), *Charleston Harbor(SC).

Construction of the Santee-Cooper complex in 1942 diverted substantial quantities of water from the Santee River into the Cooper River system. Not only did this modify the volumes of flow in both rivers, but it also produced an alteration of the Charleston Harbor environment characterized by stratifications of water which had previously been a more or less homogenous fresh and saline mixture. At the interface between tidal saline inflows and the less dense overriding freshwater, suspended material in downstream transport settles out and creates problems to navigation by its deposition in ship channels. The solution under consideration is to redivert a substantial part of the Cooper River back to its former natural course. The net effect will be a reduction of siltation in the harbor and an accompanying alleviation of the need for extensive harbor dredging. In order to study some of the questions that may accompany reduced flows in the Cooper River, a controlled low-flow period was scheduled. A mixed estuary will provide for more rapid seaward transport of bottom materials, returning this feature to prediversion conditions. The removal of such deposits will reduce oxygen uptake potentials in lower Cooper River and elsewhere in the Harbor thus alleviating previous concern of septicity that could occur during periods of low flow and elevated temperature. (See W74-09380 thru W74-09389) (Knapp-USGS)
W74-09379

STANDING CROPS OF AQUATIC ORGANISMS IN TIDAL STREAMS OF THE LOWER COOPER RIVER SYSTEM, SOUTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
W. R. Turner, and G. N. Johnson.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 13-20, April 1974. 2 fig, 4 tab.

Descriptors: *Estuaries, *Standing crops, *Productivity, *Aquatic life, *South Carolina, Aquatic animals, Fish, Aquatic productivity, Surveys, Aquatic populations, Fish populations, Biomass.
Identifiers: *Cooper River(SC).

Estimates of the standing crop and species composition of free-swimming aquatic macroorganisms were obtained in three tidal streams of the lower Cooper River system, South Carolina, once each during the spring, summer, and fall of 1971 to provide baseline data prior to further habitat modification. Forty-five species of fishes and three species of crustaceans were collected in the combined samples from the three streams. Although a greater number of species was collected during the fall (35) than during summer (33) and spring (26), greater numbers of individuals were taken during the summer (503,000/acre) and spring (189,000/acre); a mean of 122,000/acre was collected during the fall. Ten species of fishes made up 95% of the total fish catch, and three of these species accounted for 75% of that total; they were Atlantic croaker, Atlantic menhaden, and mummichog, in order of abundance. The grass shrimp was by far the most abundant of all organisms present and constituted 96% of the total number of invertebrates. Mean biomass for the three surveys was 249 pounds/acre. Invertebrates were 63% of that weight with grass shrimp accounting for 131 pounds/acre and blue crab, 19 pounds/acre. American eel dominated the fish biomass and was represented by 16 pounds/acre. The studies strongly emphasized the importance of the tidal streams as nursery areas as 65% of all organisms collected and many of the predominant forms were represented almost entirely by larval, post-larval, and juvenile stages. (See also W74-09379) (Knapp-USGS)
W74-09380

VERTICAL DISTRIBUTION OF EPIPHYTIC ALGAE ON SPARTINA ALTERNIFLORA FROM TRANSECTS ALONG THE COOPER AND WANDO RIVERS,
South Carolina Univ., Columbia.
W. T. Batson, and B. C. Blackwelder.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 22-35, April 1974.

Descriptors: *Algae, *Estuaries, *South Carolina, Data collections, Aquatic bacteria, Aquatic microorganisms.
Identifiers: *Cooper River(SC), *Spartina alterniflora.

Stalks of Spartina alterniflora from the Cooper and Wando Rivers, S.C., were collected and examined to detect the presence of epiphytic algae. Fifteen species of algae were found in the transects examined. Nine species were of the phylum Cyanophyta, three species were of the phylum Rhodophyta, and three species were of the phylum Chlorophyta. The most abundantly occurring species were Chaetomorpha minima and Entophysalis conferta. Other than algae, the most abundantly occurring epiphytes were bacteria. (See also W74-09379) (Knapp-USGS)
W74-09381

VASCULAR PLANT SURVEY OF MARSH AND ADJACENT HIGHLAND IN SELECTED PORTIONS OF COOPER RIVER AND WANDO RIVER,
South Carolina Univ., Columbia.
W. T. Batson.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 36-40, April 1974. 1 tab.

Descriptors: *Sampling, *Marsh plants, *Marshes, *Vegetation, Estuaries, Grasses, Data collections, Aquatic weeds.
Identifiers: *Cooper River(SC).

During the last half of June and the first half of July 1971, a floristic survey was conducted in the Charleston Harbor area. The study area consisted of marshlands only, and was dominated by Spartina and Juncus communities. The creek margins as well as those of the river gave evidence of a gradual long term, but significant rise in water level. This evidence was of three types. First, Juncus communities sometimes extended down to low tide level, although normally this type community develops only on higher ground and is separated from low tide level by a band of Spartina. Second, in the Juncus communities that extended to low tide level, it was frequently noted that 10 to 20 foot wide sections of the densely rooted sod had cracked deeply (1-3 feet) and tilted toward the water, and in that position was rapidly being destroyed by tidal erosion. Third, in areas where hammocks or low mounds with trees occurred, the outer trees were frequently dead and marsh vegetation invading. (See also W74-09379) (Knapp-USGS)
W74-09382

THE VEGETATION OF THE COOPER RIVER ESTUARY,
South Carolina Univ., Columbia.
R. Stalter.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 41-45, April 1974. 2 fig, 1 tab.

Descriptors: *Sampling, *Marsh plants, *Marshes, *Vegetation, Estuaries, Grasses, Data collections, Aquatic weeds.
Identifiers: *Cooper River(SC).

The vegetation of the Cooper River Estuary, South Carolina is adapted to salinity and duration and depth of flooding. The vegetation zones, listed in order of decreasing elevation above sea level are: the upper high marsh, the zone of low soil salt content (0.5% or less) and infrequent flooding, occupied by the high tide bush, sea-myrtle, high water grass, and occasionally by switch-grass; the lower high marsh, the zone of moderate soil salt content (0.3 to 3.0%) and infrequent flooding, occupied by needle rush, salt grass, glasswort, saltwater cordgrass, sea lavender, and the sea oxeye; upper low marsh, the zone of moderate to high salt content (0.5 to 3.2% and up to 5.0% in salt pans) and slightly longer periods of flooding than the Lower High Marsh, dominated by a pure stand of dwarf saltwater cordgrass; and the lower low marsh, the zone of moderate soil salt content (0.5 to 3.0%), flooded twice a day by the tides, with submergence as long as 15 hours a day, dominated by a pure stand of tall saltwater cordgrass. (See also W74-09379) (Knapp-USGS)
W74-09383

REPORT ON 'IN SITU' BENTHIC RESPIRATION AND VERTICAL OXYGEN: TEMPERATURE PROFILES.
For primary bibliographic entry see Field 5C.
W74-09384

WATER QUALITY PORTION OF THE COOPER RIVER ENVIRONMENTAL STUDY.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W74-09385

CHARLESTON AREA SEDIMENT SAMPLES,
South Carolina Pollution Control Authority, Columbia.
For primary bibliographic entry see Field 5A.
W74-09386

SURFACE WATER HYDRAULICS.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 119-123, April 1974. 2 fig, 2 tab.

Descriptors: *Estuaries, *South Carolina, *Saline water intrusion, *Flow control, Path of pollutants, Stratified flow, Streamflow, Discharge(Water).
Identifiers: *Cooper River(SC), *Charleston Harbor(SC).

Most of the Santee River (South Carolina) streamflow is diverted through Lake Moultrie into the Cooper River. The U.S. Corps of Engineers proposes to redivert the streamflow via a canal from Lake Moultrie to the lower Santee River channel. A sustained flow from Lake Moutrie of 3,000 cfs will probably be sufficient to keep saltwater below the Cooper River entrance to the Durham Creek Canal under normal tidal conditions. Just prior to the 3,000 cfs sustained-flow period, the salt-water wedge at high slack tide came to about mile 13.5, using a conductivity base of 125 micromhos as the delineation between salt and fresh water. The leading edge of the wedge evidences a greater degree of stratification at high and medium fresh-water inflows than at low freshwater inflows. After three of four days of sustained low-flow the linear extent of high tide penetration became relatively stable. The leading edge of the wedge became a diminution of well-mixed salinity in cross-sections rather than a pronounced wedge effect. The measured values of the investigated parameters remained fairly constant in absolute values at the same depth throughout the cross section. Neither DO nor pH showed much variation from saline to fresh water. At 9,300 micromhos, 16.5 deg C, DO was 7.3 ppm, pH was 7.6; at 160 micromhos, 15.5 deg C, DO was 8.2 ppm, pH was 7.2. (See also W74-09379) (Knapp-USGS)
W74-09387

SEISMIC PROFILES, COOPER RIVER.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 124-128, April 1974. 4 fig.

Descriptors: *Seismic studies, *Bottom studies, *Estuaries, *South Carolina, Profiles, Stratigraphy, Sedimentation.
Identifiers: *Cooper River(SC).

Seismic methods were used for identification of subsurface rock and sediment strata in the Cooper, Ashley, and Wando Rivers as well as the Charleston Harbor, South Carolina. The seismic study has a direct application in developments that require special foundations or piling, and in works that may involve channel modification or dredging. (See also W74-09379) (Knapp-USGS)
W74-09388

WATER SUPPLY EVALUATION AND PROPOSED COMPREHENSIVE STUDY OF THE CHARLESTON-BUSHY PARK INDUSTRIAL COMPLEX, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
R. A. Gardner, and P. W. Johnson.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 130-148, April 1974. 2 fig, 7 tab, 36 ref.

Descriptors: *Water resources development, *Hydrologic data, *South Carolina, Groundwater, Surface waters, Water supply, Data collections, Planning, Water supply, Evaluation.
Identifiers: *Cooper River(SC), *Charleston(SC).

In the area drained by the Ashley and Cooper Rivers, Charleston, South Carolina at least 10 times the amount of water currently being utilized could be developed. Enough data to plan the development of the water resources are not available. An estimated 25 mgd could be developed from surface water sources in the area (excluding diversions into the Cooper River) and an estimated 50 mgd or more could be developed from groundwater sources in the area. A plan is proposed for a full-scale investigation to develop a data system for accurately evaluating the water resources of the area and to establish the effect such development will have. (See also W74-09379) (Knapp-USGS)
W74-09389

THE EFFECT OF PROPOSED DEEPENING OF THE JOHN F. BALDWIN AND STOCKTON SHIP CHANNELS ON SALT-WATER INTRUSION, SUISUN BAY AND SACRAMENTO-SAN JOAQUIN DELTA AREAS, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W74-09408

PATHOGENIC ORGANISMS IN THE MURDERKILL RIVER ESTUARY,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-09466

THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS,
Texas Water Development Board, Austin. Coastal Zone Studies Branch and Systems Engineering Div.
J. C. Nelson, D. G. Rauschuber, and L. F. Tischler.
Water Resources Bulletin, Vol 9, No 6, p 1249-1257, 1973. 2 fig, 5 ref.

Descriptors: *Operations research, *Planning, *Water resources development, *Estuarine environment, Bays, *Texas, Limnology, Oceanography, Baseline studies, Hydrologic data, Coasts, Estuaries.

To meet statutory and growing data requirements for understanding the impact of economic growth and increased water demands on the ecosystem of Texas bays and estuaries, the Texas Water Development Board has begun extensive estuarine data collection and research designed to3 91) define relationship between the estuarine ecosystem and fresh water and nutrient inflows and (2) develop quantitative simulation techniques projecting this relationship. With the assistance of the U.S. Geological Survey's reconnaissance studies and the Texas Park and Wildlife's selected coastal zone monitoring, physical and chemical water quality and biological data on the estuarine ecosystem has been collected and analyzed. The Board also initiated the development of mathematical models of bays and estuaries. One, a tidal hydrodynamic model is designed to determine the effects of alternative estuarine development and management plans, providing data on intra-tidal behavior, sediment, water surface elevation and velocity patterns. The estuarine mass transportation model provides data on the distribution of tidal-averaged concentrations of constituents of interest at each nodal point. (Schroeder-Wisconsin)
W74-09556

ECONOMIC DEVELOPMENT STUDY OF THE TEXAS COASTAL ZONE,
Texas A and M Univ., College Station. Industrial Economics Research Div.
For primary bibliographic entry see Field 6B.
W74-09569

CHEMICAL DESCRIPTIONS OF THE OCEANS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W74-09570

HYDROGRAPHIC FRAMEWORK OF THE DOBOY SOUND ESTUARY AND SURVEYS OF THE OTHER TIDAL INLETS ALONG THE COAST OF GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
G. F. Oertel.
Georgia University Marine Science Center, Skidaway Island, Technical Report Series No 74-4, 1974. 61 p, 17 fig, 11 tab, 51 ref.

Descriptors: *Sediment transport, *Estuaries, *Georgia, Tides, Bores, Sedimentation, Littoral drift, Inlets(Waterways), Shoals, Currents(Water), Water circulation.
Identifiers: *Doboy Sound(GA).

The sediment budget was studied at the entrance of the Doboy Sound estuary, Georgia. Patterns of diversion develop in response to seasonal fluctuations in wind and wave approach interacting with inlet tidal drains. Mutually evasive flow paths of ebb and flood currents influence the formation of shoals adjacent to inlets. Shoals at the entrance to Doboy Sound are partially exposed at low water and exhibit two trends. Three shoals form an elongate-offshore orientation that extends several miles seaward of the entrance. A fourth elongate shoal is oriented parallel to the beach approximately one-quarter mile offshore. During the summer months, sediment is transported in a closed system within these shoals, and there is essentially no sediment by-passing at the inlet although some by-passing apparently takes place seaward of the entrance. This condition results in lateral and vertical expansion of shoals and in sediment 'starved' areas adjacent to shoals. Estuaries with large fluvial sources of water are distinctly different in form and hydrographic character from tidal inlets without fluvial sources of low salinity water. Sedimentation occurring in estuaries with large fluvial sources is generally a response to some form of bi-polar flow associated with a stratified water mass. The tidal inlets generally have large tidal drains that are diverted by mutually evasive tidal channels and inlet surges. (Knapp-USGS)
W74-09582

CHEMICAL SURVEY OF WATERS ADJACENT TO COLONELS ISLAND, GLYNN COUNTY, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W74-09584

DEVELOPMENT OF THE TURBIDITY MAXIMUM IN A COASTAL PLAIN ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
M. M. Nichols, and G. Thompson.
Available from NTIS, Springfield, Va. 22151 as AD-773 595, Price $3.75 printed copy; $1.45 microfiche. Final Report to U.S. Army Research Office, July 1973. 47 p, 14 fig, 2 tab, 48 ref, 2 append. DA-ARO-D-31-124-G1164 and DA-ARO-D-31-124-70-G47.

Descriptors: *Estuaries, *Turbidity, *Sediment transport, *Virginia, Floods, Sediment distribution, Density currents, Saline water intrusion, Stratified flow.
Identifiers: *Rappahannock Estuary(Va).

Turbidity in the Rappahannock Estuary, Virginia was studied to determine how high concentrations of suspended sediment accumulate to form a maximum. Time-series observations of current velocity, salinity and suspended sediment over 8 to 18 tidal cycles reveal that the maximum forms in a convergence of bottom residual currents near the transition between fresh and salty water. Sediment supplied mainly by the fiver is transported into the convergence by density currents and accumulates where velocity is nearly zero and settling rate exceeds upward current velocity. The maximum forms in the middle estuary after freshet and shifts upstream with landward shift of salt intrusion and diminished river inflow. At the same time, its intensity is reduced by settling out, reduced strength of the convergence, and increased mixing. Prime prerequisites for development are a strong convergence and high river inflow. (Knapp-USGS)
W74-09587

POLLUTION OF GROUNDWATER BY SALT INVASION,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-09594

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 5B.
W74-09602

THE COASTAL INTERCEPTOR WATERWAY,
Miami Univ., Fla.
For primary bibliographic entry see Field 5G.
W74-09614

CHANGES IN OXYGEN AND PRIMARY PRODUCTION OF THE PATUXENT ESTUARY, MARYLAND, 1963 THROUGH 1969,
Geological Survey, Edgewater, Md.
For primary bibliographic entry see Field 5B.
W74-09624

STUDIES OF THE SEASONAL VARIATION OF THE SUSPENDED MATTER OF THE MENAI STRAITS. II. MID STREAM DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W74-09741

APPLICATION OF REAL-TIME MASS SPECTROMETRIC TECHNIQUES TO ENVIRONMENTAL ORGANIC GEOCHEMISTRY. II. ORGANIC MATTER IN SAN FRANCISCO BAY AREA WATER,
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 5A.
W74-09742

MIGRATION AND REDISTRIBUTION OF ZINC AND CADMIUM IN MARINE ESTUARINE SYSTEM,
Geological Survey, Corpus Christi, Tex.
For primary t(Tex.),graphic entry see Field 5B.
W74-09777

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FINAL ENVIRONMENTAL STATEMENT, (OFFICE OF SALINE WATER)--FIVE YEAR EXTENSION RESEARCH AND DEVELOPMENT, PUBLIC LAW 92-60.
Office of Saline Water, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22151, as EIS-73-0266-F, $7.00 paper copy. February 1973. 100 p, 10 ref, append.

Descriptors: *Saline water, *Desalination, *Research and development, *Water supply, *Water management(Applied), Legislation, Water utilization, Water reuse, Sewage, Sewage treatment, Effluents, Water quality, Water resources, Water resources development, Corrosion, Brines, Environmental effects, Surface waters, Groundwater, Weather modification, Cooling water, Industrial water, Municipal water, Agriculture.
Identifiers: *Environmental Impact Statements, San Diego(Calif.), Roswell(N.M), Freepor

Webster(S.D), Wrightsville Beach(N.C.), Fountain Valley(Calif.).

Effects of a five-year extension of the Saline Water Conversion Program for fiscal years 1973 through 1977 are evaluated. The program is designed to develop and demonstrate practical means to convert saline water and other chemically contaminated water to a quality suitable for municipal, industrial, agricultural and other beneficial uses. Current operational aspects of the test facilities such as the concentration of influent water and discharge of brine, the use of water for direct cooling, the introduction of trace quantities of corrosion products and the consumption of energy were determined to have quantitatively negligible impact on the environment. Alternatives to the proposed action which were considered included surface water development, groundwater development, improved water management practices and recycling of sewage and effluents for use in industry and agriculture. Also considered were various forms of weather modification to increase precipitation, as well as taking no action. (Ritchie-Florida)
W74-09280

MEMBRANE REGENERATION FOR WASTEWATER RECLAMATION USING REVERSE OSMOSIS,
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Program.
For primary bibliographic entry see Field 5D.
W74-09554

MEMBRANE SCIENCE AND TECHNOLOGY.
For primary bibliographic entry see Field 5D.
W74-09633

3B. Water Yield Improvement

RESULTS GENERATED FROM A ONE-DIMENSIONAL WARM FOG MODEL WHICH SIMULATES HYGROSCOPIC SEEDING,
Navy Weather Research Facility, Norfolk, Va.
P. M. Tag.
Available from NTIS, Springfield, Va 22151 AD-769 226 Price $5.50 printed copy; $1.45 microfiche. Technical Paper No 11-71, May 1971. 63 p, 25 fig, 1 tab, 14 ref.

Descriptors: *Cloud seeding, *Fog, *Weather modification, Artificial precipitation, Chemistry of precipitation.
Identifiers: *Hygroscopic seeding.

The processes involved in clearing fog were studied to provide guidelines for field experimentation. Using a single-dimensional, 10-level, microphysical fog model, computer runs were made to determine the effect of hygroscopic seeding, method of seeding, and fog conditions under which hygroscopic seeding would be effective. Diagrams were drawn to show the degree of dependence of successful clearing upon treatment concentration and droplet spectrum. These diagrams were drawn for two fog types--one, a dense advective fog of depth of 300 m.; the other, a less dense radiation fog of a depth of 150 m. The difficulty of hygroscopic seeding increases with fog depth and water content. (Knapp-USGS)
W74-09322

PROJECT CUM II--STUDIES OF THE RAIN PARAMETERS OF RANDOMLY SEEDED WARM AND COLD CUMULI,
Weather Science, Inc., Norman, Okla.
J. L. Sutherland, and D. R. Booker.
Available from NTIS, Springfield, Va. 22151 as AD-768 970, Price $3.00 printed copy; $1.45 microfiche. Air Force Cambridge Research Laboratories Technical Report AFCRL-TR-73-0515, July 1973. 32 p, 13 fig, 3 tab. AFCRL Contract F19628-70-C-0228.

Descriptors: *Cloud seeding, *Cloud physics, Florida, Oklahoma, Weather modification, Precipitation(Atmospheric), Artificial precipitation.
Identifiers: *Cloud seeding(Hygroscopic).

In a cold cumulus seeding experiment in New Mexico in 1969 silver iodide seeding resulted in more small raindrops and generally fewer large raindrops in light rain. Also, the seeded clouds tended to have higher maximum rainfall rates. Two hygroscopic seeding experiments were run on warm cumuli off the Florida coast and in Oklahoma. The maritime Florida clouds were modified by encapsulated urea seeding so that the initial surge of large raindrops at the beginning of showers was displaced toward the middle of the life of the seeded showers. The slope of the raindrop spectra of the seeded Florida clouds was less steep, implying more large drops and fewer small drops. Even though the raindrop spectra are significantly different, the difference is not large enough to cause a significant difference in the radar reflectivity-rainfall rate relationship. The continental warm cumuli in Oklahoma were not apparently affected by the hygroscopic seeding; however, the seeding amount was appreciably smaller. (Knapp-USGS)
W74-09370

PROCEDURE FOR EVALUATING THE EFFECT OF CONVECTIVE CLOUD MODIFICATION FOR THE PURPOSE OF ARTIFICIALLY CONTROLLING PRECIPITATION AND THE RESULTS OF AIRCRAFT STUDIES ON THE STRUCTURE OF CUMULUS CLOUDS,
M. V. Buykov, F. Ya. Voyt, Ye. Ye. Korniyenko, I. A. Kureyko, and A. I. Furman.
Available from NTIS, Springfield, Va. 22151, as AD-767 986, Price $3.00 printed copy; $1.45 microfiche. Air Force Foreign Technology Division Translation Report FTD-HT-23-804-73, September 1973. 14 p, 1 tab, 20 ref. (Translated from Trudy v Vsesoyuznogo Meteorologicheskogo S Yezda, Sektsiya Aktivnykh Vozdeystviy na Atmosfernyye Protsessy, Vol 4, p 87-96, 1972).

Descriptors: *Cloud seeding, *Weather modification, Cloud physics, Mathematical models, Storm structure, Precipitation(Atmospheric).
Identifiers: *USSR(Ukraine), *Cumulonimbus clouds.

Cumulonimbus clouds may play a major role in artificial control of precipitation over the steppe area of the Ukraine. In the steppe of the Ukraine, developed cumulonimbus clouds have considerable thickness. Their summits are at an altitude of 6-7 km and higher; the temperature at the level of the summit, as a rule, is below -20 deg. A theoretical model was developed to describe the precipitation formation process in cumulonimbus, providing for calculation of total precipitation falling from a cloud during its natural development or during modification. To check the model, field experiments were performed, as a result of which information on total precipitation from seeded and unseeded clouds was obtained. (Knapp-USGS)
W74-09378

WATER SUPPLY EVALUATION AND PROPOSED COMPREHENSIVE STUDY OF THE CHARLESTON-BUSHY PARK INDUSTRIAL COMPLEX, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 2L.
W74-09389

CLOUD SEEDING FOR SNOW AUGMENTATION: LAND USE RAMIFICATIONS OF RESIDUAL SILVER IODIDE NUCLEATING AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-09606

3C. Use Of Water Of Impaired Quality

EFFECT OF DETERGENT-LADEN WATER ON THE GROWTH OF CORN,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
W. Kroontje, J. N. Judy, and H. C. H. Hahne.
Available from the National Technical Information Service as PB-233 331, $3.75 in paper copy, $1.45 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 62, August 1973. 50 p, 5 fig, 22 tab, 25 ref. OWRR A-041-VA(3).

Descriptors: *Detergents, *Waste treatment, Plant Growth, Crop production, *Corn(Field), *Growth rates, *Loam, Soil types, *Regression analysis, *Water reuse.
Identifiers: Norfolk fine sandy loam, Davidson clay loam, Plant yields.

A greenhouse experiment was conducted to determine the effects of two detergents on the growth of corn (Zea mays L.) when the detergent was individually applied to Davidson clay loam and Norfolk fine sandy loam. The detergents used were a heavy-duty non-enzyme detergent (Bz) and a heavy-duty enzyme detergent (Tx). These were applied in irrigation water at concentrations of 0, 20, 800, 1600, 4800, 8000, 10,000, 12,000 and 14,000. Stimulations in growth occurred on the Davidson soil that received 1600 ppm Bz and 800, 1600, 4800, and 8000 ppm Tx, and on the Norfolk soil that received 800 ppm Tx. These stimulations were attributed to responses to phosphorus contained in the detergents. Abnormal growth characteristics were observed on many treatments, and yield decreases were noted on the Davidson soil that received 8000, 10,000, 12,000 and 14,000 ppm Bz and 14,000 ppm Tx. Regression analyses showed that the detrimental effects on plant yields were due to soluble salt damages caused by the sodium in the detergents on all treatments except where Tx was applied to the Norfolk soil. In the latter case, specific sodium effects could not be separated from general salinity effects. Detergent Bz was more detrimental to plant growth than Tx.
W74-09256

APPLICATION OF SEWAGE SLUDGE TO AGRICULTURAL LAND IN MINNESOTA (FINAL ENVIRONMENTAL STATEMENT),
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-09265

WATER BALANCE IN SEWAGE STABILIZATION LAGOONS,
North Dakota Univ., Grand Forks. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-09361

STUDIES ON INTERNAL REUSE OF SULFITE EVAPORATOR CONDENSATES (UNTERSUCHUNGEN ZUR INNERBETRIEBLICHEN WIEDERVERWENDING VON SULFITABLAUGENEINDAMPFKONDENSATEN),
Institut fuer Zellstoff und Papier, Heidenau (East Germany).
For primary bibliographic entry see Field 5D.
W74-09453

WASTEWATER RECLAMATION: SOCIO-ECONOMICS, TECHNOLOGY, AND PUBLIC ACCEPTANCE.
Ralph Stone and Company, Inc., Los Angeles, California.
For primary bibliographic entry see Field 5D.
W74-09662

HUMIDITY EFFECTS ON YIELD AND WATER RELATIONS OF NINE CROPS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. J. Hoffman.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 164-167, January-February, 1973. 2 fig, 3 tab, 12 ref.

Descriptors: *Humidity, *Crop response, Mist, Moisture, Precipitation(Atmospheric), Water vapor, Yield equations, Water utilization, *Salt tolerance.

The effect of humidity on the growth, yield, and water relations of nine crops grown under essentially the same controlled environmental conditions is described. Having essentially the same environment makes comparisons among crops possible. The data have been taken from various experiments conducted at the U.S. Salinity Laboratory to establish the interaction between atmospheric relative humidity and the salt tolerance of the crop. All the data reported are from nosaline treatments. The results are therefore independent of salinity. (Skogerboe-Colorado State)
W74-09796

3D. Conservation In Domestic and Municipal Use

COMMUNICATIONS FOR URBAN WATER RESOURCES MANAGEMENT--A REVIEW AND ANNOTATED BIBLIOGRAPHY,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 6B.
W74-09251

DECISION ANALYSIS ON WATER RESOURCES PLANNING AND MANAGEMENT FOR AN ARID METROPOLITAN CENTER IN WEST TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 6A.
W74-09364

THE FUTURE OF THE URBAN HABITAT,
California Univ., Los Angeles.
For primary bibliographic entry see Field 6E.
W74-09413

LAND-USE INSTITUTIONS IN THE WASHINGTON-BALTIMORE REGION-A MIRROR FOR METROPOLITAN AMERICA,
Carnegie Institution of Washington, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-09414

LAND-USE RESEARCH ISSUES SUGGESTED BY A NATIONAL URBAN GROWTH STRATEGY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Urban Studies and Planning.
For primary bibliographic entry see Field 4A.
W74-09415

CONTINUOUS SIMULATION MODELS IN URBAN HYDROLOGY,
Organization Stanford Univ., Calif.
R. Linsley, and N. Crawford.
Geophysical Research Letters, Vol 1, p 59-62, May 1974. 2 fig, 10 ref.

Descriptors: *Simulation analysis, *Urban hydrology, *Storm runoff, Planning, Management, Probability, Information retrieval, Rainfall, Hydrographs, Storage, Volume, Streamflow, Water quality, Water quantity, Flood control, Channels, Storm drains, Design, Watersheds(Basins), Hydrologic data, Computer models, Systems analysis.
Identifiers: Flowcharts, Peak flow.

Continuous hydrologic simulation is defined and the Hydrocomp Simulation Program, a version of the Stanford Watershed Model, is described. The information needs for urban water management systems are discussed and the use of continuous simulation of hydrologic data in meeting these information needs is reviewed. The most important information for dealing with problems of urban storm runoff and urban storm runoff quality is the probability of occurrence of events of various magnitudes. This information is readily obtainable through the use of continuous simulation models. It is not obtainable with discrete event simulation models based on the assumption that the probability of the runoff event is equal to the probability of the rainfall event which caused it. (Bell-Cornell)
W74-09479

MEAN PRECIPITATION AND SNOWFALL MAPS FOR A MOUNTAINOUS AREA OF POTENTIAL URBAN DEVELOPMENT,
Atmospheric Environment Service, Vancouver, (British Columbia).
For primary bibliographic entry see Field 2C.
W74-09612

INDEPENDENT COMPARISON OF THREE URBAN RUNOFF MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-09629

URBANIZED AREAS SERVED BY SEWERS AND SEPTIC TANKS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W74-09639

PUBLIC WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W74-09640

OPTIMAL CONTROL OF FLOW IN COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-09652

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER QUALITY MANAGEMENT ON LAKE ERIE: YEAR TWO,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 5G.
W74-09653

COMPUTER MODELING APPLICATIONS IN URBAN WATER PLANNING,
Denver Board of Water Commissioners, Colo.
For primary bibliographic entry see Field 6A.
W74-09654

METHOD FOR TREATING WATER CONTAINING SUSPENDED SOLIDS FROM A SANITARY SYSTEM,
Ecodnye Corp., Chicago, Ill. (assignee).
For primary bibliographic entry see Field 5D.
W74-09724

3E. Conservation In Industry

REUSE AND RECYCLE OF WATER IN INDUSTRY,
Bostock Hill and Rigby, Birmingham (England).
For primary bibliographic entry see Field 5D.
W74-09444

STUDIES ON INTERNAL REUSE OF SULFITE EVAPORATOR CONDENSATES (UNTERSUCHUNGEN ZUR INNERBETRIEBLICHEN WIEDERVERWENDING VON SULFITABLAUGENEINDAMPFKONDENSATEN),
Institut fuer Zellstoff und Papier, Heidenau (East Germany).
For primary bibliographic entry see Field 5D.
W74-09453

PULP MILL WASTE WATERS: DISCHARGE AND PURIFICATION (ZELLSTOFFABWAESSER: ANFALL AND REINIGUNG),
Technische Hochschule, Vienna. (Austria). Institut fuer Wasserversorgung Abwasserreiningung und Gewasserschuts.
For primary bibliographic entry see Field 5D.
W74-09455

CLEANING UP: PAPER INDUSTRY'S MESS,
For primary bibliographic entry see Field 5G.
W74-09458

WASTE WATER LOADS AND THEIR POSSIBLE REDUCTIONS IN THE FINNISH FOREST INDUSTRY (SUOMEN METSAETEOLLISUUDEN JAETIEVESIKUORMITUS JA SEN KEHITYSNAEKMAT),
Finnish National Water Board, Helsinki.
For primary bibliographic entry see Field 5B.
W74-09465

POSSIBILITIES FOR REDUCING THE EFFLUENT LOAD OF SULFITE PULP MILLS (MOEGLICHKEITEN ZUR BEHEBUNG DER ABWASSERBELASTUNG DURCH SULFITZELLSTOFFANLAGEN),
For primary bibliographic entry see Field 5D.
W74-09474

PAPER INDUSTRY AND ENVIRONMENTAL QUALITY,
International Paper Co., Ticonderoga, N. Y. Solid Waste Management.
For primary bibliographic entry see Field 5D.
W74-09475

THE ENVIRONMENTAL IMPACT CONCEPT, AND ITS EFFECT ON THE NATIONAL GAS INDUSTRY,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 5C.
W74-09489

ECONOMIC IMPACT OF FWPCA WATER EFFLUENT STANDARDS AND GOALS.
For primary bibliographic entry see Field 5D.
W74-09497

STATE-OF-THE-ART OF WASTE DISPOSAL IN THE COATINGS INDUSTRY (AS OF JUNE 1973),
For primary bibliographic entry see Field 5E.
W74-09506

A TEST OF ALTERNATIVE MODELS FOR PROJECTING COUNTY INDUSTRIAL

PRODUCTION AT THE 2, 3, AND 4-DIGIT STANDARD INDUSTRIAL CODE LEVELS,
Livingston Coll., New Brunswick, N.J.
M. R. Greenberg.
Regional and Urban Economics, Vol 1, No 4, p 397-417, 1972. 1 fig, 5 tab, 38 ref. OWRR C-1629 (No. 3147) (5).

Descriptors: *Appreciation, *Estimating, *Projections, Model studies, Regional economics, *Economic prediction, New York, Water supply, Waste disposal.
Identifiers: *New York Region.

A series of projection techniques designed to estimate the value added by 42 industries in the 23-county New York Region are examined, and alternative combinations of models which consider industrial mixes, regional and intraregional shares are explored. Four potential projection paths--direct county output projections, regional output estimates allocated to county, national value added projections directly allocated to counties, and national projections allocated to the region, then to the county, were considered with the last chosen because of its reliability and limited data requirements. National coefficients developed by the Bureau of Labor and Statistics are utilized, with alternative assumptions as to unemployment, capital investment, and demand, to create a national input-output matrix yielding individual industries' growth rates. To apportion national value added estimates to the region, industries are first classified as to residentiary or supply characteristics utilizing the population ratio, one of the five methods considered. To extrapolate regional shares, variations of the constant share of national output and shift-share techniques are illustrated. Four methods, constant share, shift-share, extrapolation of absolutes output and regression were used to allocate regional shares to the counties. Data problems of each method are explored. (Schroeder-Wisconsin)
W74-09551

SUPPLY-ECONOMIC RELATIONSHIPS OF OFFSHORE PETROLEUM OPERATIONS,
National Petroleum Council, Washington, D.C.
V. M. Brown.
In: Ninth Annual Conference of Marine Industries 'Problems and Opportunities,' September 10-12, 1973, Washington, D.C., p. 243-252. 2 fig., 6 tab.

Descriptors: *Oil fields, *Natural gas, *Leases, *Coasts, Capital costs, Financing, Exploration, Oil industry, Research and development, Forecasting, Drilling, Prices, Fuels.
Identifiers: *Continental shelf.

Predicted doubling of energy requirements suggests a growing need to develop U.S. offshore reserves where 50% of the remaining potential oil and gas supplies lie. The U.S. Energy Outlook Study, source of this report, provides 1971-1985 projections of U.S. energy demand, supply, and financing requirements. Under alternative supply forecasts, the average primary fuel unit revenue required to support various levels of exploration and development is computed. Assuming an intermediate energy requirement, a number of conclusions can be drawn. Domestic energy supplies, presently providing 88% of U.S. requirements may in the future provide between 62-89% of future requirements. By 1985 oil imports are estimated to provide 6-33% of energy requirements and 18-65% of total oil supply. Capital requirements covering all aspects of oil and gas development are expected to range between $88-172 billion over the period to 1985. Lead time requirements are also expected to increase. Impacts of alternative governmental taxing or leasing policy are also evaluated. No future leasing of the remaining 14 million coastal acres could lead to major declines in total domestic production. Removal of the cash bonus payments presently required could lead to price declines of $1.14-$1.33/oil barrel or 9.2 cents-12.3 cents/1000 cu. feet. (Schroeder-Wisconsin)
W74-09552

ECONOMIC DEVELOPMENT STUDY OF THE TEXAS COASTAL ZONE,
Texas A and M Univ., College Station. Industrial Economics Research Div.
For primary bibliographic entry see Field 6B.
W74-09569

SOME CONSERVATION PROBLEMS IN THE METAL-FINISHING INDUSTRY,
Bostock, Hill and Rigby, Birmingham (England).
For primary bibliographic entry see Field 5D.
W74-09577

INDUSTRIAL WASTE TREATMENT OPPORTUNITIES FOR REVERSE OSMOSIS,
Eastman Chemical Products, Inc., Kingsport, Tenn. Polymer Technology Div.; and Eastman Chemical Products, Inc., Kingsport, Tenn. Photographic Technology Div.
For primary bibliographic entry see Field 5D.
W74-09635

REVERSE OSMOSIS: APPLICATION TO POTATO-STARCH FACTORY WASTE EFFLUENTS,
Agricultural Research Service, Philadelphia, Pa. Eastern Utilities Research and Development Div.
For primary bibliographic entry see Field 5D.
W74-09637

PROTEIN RECOVERY FROM PROCESS EFFLUENTS USING ION-EXCHANGE RESINS,
Tasman Vaccine Lab. Ltd., Poole (England). Ecotech Systems Div.
For primary bibliographic entry see Field 5D.
W74-09747

SOLVENT EXTRACTION IN PROCESSES FOR METAL RECOVERY FROM SCRAP AND WASTE,
Warren Spring Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W74-09784

3F. Conservation In Agriculture

PROPOSED IRRIGATION DISTRIBUTION SYSTEM FOR POND-POSO IMPROVEMENT DISTRICT (PL 984), KERN COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Mid-Pacific Regional Office, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W74-09263

PROCEEDINGS-WORKSHOP ON LAND DISPOSAL OF WASTEWATERS.
North Carolina State Univ., Raleigh. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W74-09422

LAND APPLICATION OF WASTEWATER,
Environmental Protection Agency, Washington D.C. Div. of Municipal Waste Water Programs.
For primary bibliographic entry see Field 5D.
W74-09423

IRRIGATION COST FOR LAND DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-09428

TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-09430

WATER PROBLEMS IN THE ARID WESTERN REGIONS OF THE USA, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-09469

FUNCTIONS TO PREDICT OPTIMAL IRRIGATION PROGRAMS,
California Univ., Davis. Dept. of Water Science and Engineering.
J. I. Stewart, R. M. Hagan, and W. O. Pruitt.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR2, Paper No 10626, p 179-199, June 1974. 5 fig, 5 tab, 36 ref.

Descriptors: *Irrigation programs, *Irrigation efficiency, *Optimum devesedment plans, Evapotranspiration, *Droughts, Scheduling, Soil water, Vegetation, Seasonal, Corn(Field), Research, Measurement, Systems analysis.
Identifiers: *Production functions, *Prediction, Growth characteristics, Production engineering.

Maximum water-use efficiency often occurs at irrigation levels still lower than the maximum profit point. A methodology is presented for prediction of optimal irrigation programs at any given level of irrigation water supply. The prediction is based on analysis of: (1) Davis, California research findings concerning growth characteristics of the crop which influence maximum yield, evapotranspiration (ET) requirement, soil water uptake, and response to ET deficits; and (2) measurements of climate, soil, and irrigation system performance which influence the requirement for ET to be supplied from irrigation, and the percentage of irrigation water evapotranspired. An optimal program maximizes profit or water-use efficiency. Programming dates and depths of irrigations are ba on comparison of the estimated sequence of maximum ET rates throughout the season with the sequence of actual ET rates expected if no irrigation is given. The difference constitutes an expected sequence of ET deficits which carefully programmed irrigations may alleviate fully or in part. Time relationships of corn leaf canopy and root system development researched at Davis are combined with irrigation planning site measurements of climate, soil, and soil water content to estimate the sequence of ET deficits. Measurement of actual irrigation operational efficiency completes the needed information. (Bell-Cornell)
W74-09476

THE LAND TREATMENT PROCESS FOR WASTEWATER RENOVATION,
Illinois, Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-09486

ACCELERATED GROWTH IN AGRICULTURAL PRODUCTION AND THE INTERSECTORAL TRANSFER OF RESOURCES,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
J. W. Mellor.
Occasional Paper No. 34, January 1972. 21 p, 1 tab.

Descriptors: *Agriculture, *Productivity, *Capital mobility, Prices, Investment, Economic impact, Industrial production, Taxes, Political constraints, Institutional constraints.
Identifiers: Intersectoral resource flow.

Three areas of intersectoral resource flows are examined. A historical view of the size and direction of intersectoral resource transfers and the impact

of various institutional devices facilitating such transfers are explored for Taiwan with comparisons to several developing and developed countries. For Taiwan, a table of intersectoral flows between the agricultural and nonagricultural sectors over 1895-1960 is presented. In 1911-20, 1921-25, 1950-55 and 1956-60, for example, the percent of agricultural sales or total agricultural production representing real resource transfers were 50, 30; 40, 25; 40, 20; and 24, 15%, respectively. Variations in transfers caused by institutional changes are identified. The impact of technical change such as new crop varieties, irrigation, and fertilizer use on intersectoral flows is explored. The impact depends on both the capital:output ratio associated with the technical change and the resultant change in consumption of the agricultural sector. The characteristics of technical changes are examined to determine the appropriate institutional devices to maintain the intersectoral transfer. Land taxes, or relative agricultural price declines are cited as preferable over variable input taxes even though political difficulties in utilizing the former exist. (Schroeder-Wisconsin)
W74-09550

GROWTH OF SUBIRRIGATED JAPANESE HOLLY AS AFFECTED BY SOIL TYPE AND DEPTH,
Georgia Univ., Athens. Dept. of Horticulture.
For primary bibliographic entry see Field 2I.
W74-09600

HEAVY MANURE APPLICATIONS: BENEFIT OR WASTE,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 5D.
W74-09698

EFFECTS OF SOLID BEEF FEEDLOT WASTES ON SOIL CONDITIONS AND PLANT GROWTH,
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 5D.
W74-09699

GRASS RESPONSE TO APPLICATIONS OF BEEF-CATTLE FEEDLOT RUNOFF,
For primary bibliographic entry see Field 5D.
W74-09700

A STUDY OF CORN RESPONSE AND SOIL NITROGEN TRANSFORMATIONS UPON APPLICATION OF DIFFERENT RATES AND SOURCES OF CHICKEN MANURE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-09701

SURFACE RUNOFF NUTRIENT LOSSES FROM VARIOUS LAND DISPOSAL SYSTEMS FOR DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-09702

LINER INSERTING MACHINE FOR PIPELINES,
For primary bibliographic entry see Field 8C.
W74-09722

ON THE PRESSURE CHAMBER TECHNIQUE FOR ESTIMATING LEAF WATER POTENTIAL IN SORGHUM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
A. Blum, C. Y. Sullivan, and J. D. Eastin.
Agron J. Vol 65, No 2, p 337-338, 1973. Illus.

Identifiers: *Leaf-water potential, *Pressure chamber technique, *Sorghum, Sorghum-bicolor.

The purpose of this work was to re-evaluate the pressure chamber technique for estimating leaf water potential in sorghum (Sorghum bicolor (L.) Moench), with special reference to problems associated with leaf sample crushing under pressure and pressure rate increase inside the chamber. Pressure chamber readings were compared to Spanner-type thermocouple psychrometer readings on leaves of 5 sorghum genotypes at several stages of growth. A leaf sample holder, constructed from Silicon rubber and accommodated into a brass flange, reduced leaf crushing under pressure. It was found that pressure chamber readings (xylem pressure) cannot be directly used as an estimate of leaf water potential, but should be corrected according to a calibration against a thermocouple psychrometer determination of leaf water potential. Different rates of pressure increase in the chamber affected the regression between xylem pressure and leaf water potential. The regression improved with a greater pressure rate increase as indicated by smaller error variance estimate. No differences were detected between genotypes in this regression. This technique is, therefore, useful if worked out according to a calibration curve at a standard rate of pressure increase.--Copyright 1973, Biological Abstracts, Inc.
W74-09730

CADMIUM UPTAKE BY WHEAT FROM SEWAGE SLUDGE USED AS A PLANT NUTRIENT SOURCE, A COMPARATIVE STUDY USING FLAMELESS ATOMIC ABSORPTION AND NEUTRON ACTIVATION ANALYSIS,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5C.
W74-09758

TIME IT RIGHT,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
E. A. Hiler.
Irrigation Age, Vol 6, No 10, p 10-14, 16, May, 1972. 1 fig, 4 tab.

Descriptors: *Irrigation practices, *Irrigation programs, Soil moisture, Crop response, Irrigation systems, Stress.

Proper irrigation scheduling becomes increasingly important when available water supplies are short and/or costly. With proper irrigation scheduling, improved crop yields can be obtained and, often more importantly, water-use efficiencies can be increased. Both timing and amount of irrigation affect water-use efficiency; however, research has shown timing has the greatest effect because at critical growth stages, excessive crop water deficit can irreversibly reduce the potential yield and quality of the crop. A concept which is useful in optimizing irrigation timing is stress day index (SDI). Various methods for irrigation timing, the SDI concept, how this concept is utilized for timing irrigations, and experimental results comparing the SDI concept with other irrigation timing methods are described. (Skogerboe-Colorado State)
W74-09795

HUMIDITY EFFECTS ON YIELD AND WATER RELATIONS OF NINE CROPS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W74-09796

GUIDELINES FOR SUCCESSFUL CENTER-PIVOT IRRIGATION,
M. Miller.
Irrigation Age, Vol 6, No 6, p 8, 76-77, January, 1972. 2 fig.

Descriptors: *Irrigation practices, Surface irrigation, *Sprinkler irrigation, Irrigation systems, Irrigation design.
Identifiers: Center-pivot irrigation.

A summary of the factors necessary for successful operation of a center-pivot sprinkler system is presented. A list of Do's and Don'ts has been developed. A state-of-the-art summary is included. (Skogerboe-Colorado State)
W74-09798

MORE PRODUCTION...FEWER IRRIGATIONS,
T. Milligan.
Irrigation Age, Vol 6, No 12, p 20, 21, 26, 27, July, 1972. 1 fig, 1 tab.

Descriptors: *Irrigation practices, *Irrigation programs, Soil moisture, Crop response, Irrigation systems, Surface irrigation.

Irrigation activities are described. Approximate figures for peak water use by various crops are given by climate. (Skogerboe-Colorado State)
W74-09799

OPTIMIZING SURFACE IRRIGATION UNIFORMITY BY NONUNIFORM SLOPES,
CH2M-Hill, Redding, Calif.
G. M. Powell, M. E. Jensen, and L. G. King.
Paper No 72-721 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois. 19 p, 6 fig, 22 ref.

Descriptors: *Irrigation, *Irrigation practices, Surface irrigation, Farrow irrigation, Irrigation design, Irrigation efficiency, Uniformity coefficient, *Slopes, Mathematical models, Computer models.

A mathematical computer model of surface irrigation was developed to consider nonuniform slopes and depth-dependent infiltration functions. The model is based on a predictor-corrector technique in which the advance for each time increment is predicted and the water surface profile computed. After computing surface and subsurface storage volumes, the predicted advance is adjusted by a volume balance correction procedure. The computation is fast and verification of the model with field data indicates the model is as accurate as measured input field parameters. The model was used to demonstrate the effect of slope profile on water distribution in furrow irrigation. A concave slope profile shows a significant improvement in water distribution over a uniform slope. A convex slope results in a significantly poorer distribution. The model can also be used to evaluate existing surface irrigated fields with uniform or nonuniform slopes. (Skogerboe-Colorado State)
W74-09800

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

RAYSTOWN LAKE--RAYSTOWN BRANCH JUNIATA RIVER, PENNSYLVANIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 8D.
W74-09262

PROPOSED IRRIGATION DISTRIBUTION SYSTEM FOR POND-POSO IMPROVEMENT DISTRICT (PL 984), KERN COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Mid-Pacific Regional Office, Sacramento, Calif.
Available from the National Technical Information Service, Springfield Va. 22151 as EIS-CA-73-1741-F, $5.50 in paper copy. November 1, 1973. 62 p, 1 plate, 1 map, 3 append.

Descriptors: *Water resources development, *Environmental effects, *Water works, *Water management(Applied), *Irrigation engineering, *Agriculture, Water supply, *California, Water demand, Administration, Federal project policy, Project planning, Project purposes, Water yield improvement, Water users, Water quality, Water distribution(Applied).
Identifiers: *Environmental Impact Statements, *Kern Co.(Cal.).

The proposed project is for the construction of irrigation distribution systems consisting of lined and unlined canals, pipelines, pumping plants and related water works. The system would convey 67,000 acre-feet of water per year from the California Aqueduct to about 22,300 acres of District lands where a variety of truck and field crops are grown. An additional 23,400 acres will continue to be irrigated from ground water sources. The imported water supply would alleviate the ground-water overdraft, aiding in halting land subsidence and improving ground-water quality, making for continued use of the District lands for agricultural production. Drainage facilities are not anticipated to be required and no significant effect is forseen on the fish and wildlife populations. Only minor amounts of land will be removed and there is the possibility of a minor increase in mosquito population. Alternatives considered were maintaining the status quo, and obtaining the water supply from other sources. (Sutton-Florida)
W74-09263

BEACH EROSION CONTROL STUDY ON MANATEE COUNTY, FLORIDA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
Available from the National Technical Information Service, Springfield Va. 22151 as EIS-FL-73-1462-F, $4.00 in paper copy. September 6, 1973. 40 p, 21 append, 5 photo, 1 map.

Descriptors: *Beach erosion, *Erosion control, *Dredging, *Florida, *Environmental effects, Shore protection, Hurricanes, Accelerated erosion, Flood damage, Turbidity, Currents, Sea water, Bottom fauna, Littoral, Quartz, Silt, Ocean waves, Sea walls, Gulf of Mexico, Swimming, Tourism, Economic impact, Land use, Recreational demand, Land fills.
Identifiers: *Environmental Impact Statements, *Anna Maria Key(Manatee County-Fla.), Coastal waters, Fill permits.

The project of restoring 3.2 miles of eroded beach along the Gulf shore of Anna Maria Key, Manatee County, Florida is evaluated. Periodic nourishment will be required to compensate for erosion losses throughout the 50-year life of the project. About 940,000 cubic yards of material will be dredged from offshore and placed on the beach. The beach will be temporarily closed during construction operations. Dredging will temporarily degrade water quality, and will destroy most benthic animals in bottom sediments and cover those in the beach nourishment area. The basic alternative is to take no action and leave the beach in its present condition. This provides no relief from the problem of rapidly eroding beach and damage to shore structures caused by wind and wave action. Other alternatives such as groins, seawalls, and revetments were considered. Such structures alone are not conducive to the formation and retention of a recreational beach, and represent an obstruction to the natural environment. Except for the loss of limited quantities of marine fauna and commitment of labor resources during dredge and fill activities, no irreversible or irretrievable commitment of resources is expected. (Kelly-Florida)
W74-09264

MAINTENANCE OF THE NEWARK BAY, HACKENSACK AND PASSAIC RIVERS NAVIGATION PROJECT, NEW JERSEY (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York, N.Y.
Available from the National Technical Information Service, Springfield, Va., 22151, as EIS-NY-73-0987-F, $4.00 in paper copy. February 9, 1973. 36 p, 6 map, 4 tab, 9 append.

Descriptors: *Permits, *Harbors, *Rivers, *Dredging, *Federal government, Administrative agencies, Channelization, Navigation, Navigable waters, Vessels, Industrial pollution, Industrial wastes, Municipal wastes, Pollutants, Environmental effects, Water quality, Water policy, Water management, *New Jersey, Fishlife, Wildlife, Ecology, Waste discharge, Cities.
Identifiers: *Environmental Impact Statements, *Newark Bay(N.J.), Hackensack River(N.J.), Passaic Rivers(N.J.).

This final environmental impact statement deals with the maintenance of the Newark Bay, the Hackensack and Passaic Rivers Navigation Project, in New Jersey. Before concluding that the project was within the environmental guidelines, the following were considered: environmental implications, social well-being, engineering, economic and other public interest considerations. The feasibility and repercussions of dredging for navigation purposes were emphasized, as the area is a major link in the northeast shipping corridor. Plans for the dredging and channelization were approved, noting the dense industrialization of the area and the dependency of a major portion of the Midwest upon unhindered access to the harbor. Fish and wildlife resources of the area were negligible since industrial and commercial activities and the discharge of sanitary effluent by local communities have already polluted the surrounding waters. Large amounts of polluting substances enter the water daily, especially from industrial sources. (Silber-Florida)
W74-09267

EL DORADO LAKE, WALNUT RIVER, KANSAS, VOLUME 1, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
Available from the National Technical Information Service, Springfield, Va., 22151, as EIS-KS-72-5351-F-1. September 1972. 145 p, 42 tab, 29 fig.

Descriptors: *Kansas, *Environmental effects, *Reservoirs, *Surface waters, *Dams, *Flooding(Intentional inundation), Dam construction, Damsites, Water control, Backwater, Flood control, Water utilization, Water supply, Water storage, Stream flow, Wildlife, Water quality control, Recreation, Fisheries, Non-structural alternatives.
Identifiers: *Environmental Impact Statements, *Walnut River(Kan.).

Action involves construction of a dam and reservoir for El Dorado Lake located at river mile 100.2 on the Walnut River in Butler County, Kansas. Project purposes are flood control, water supply, water quality control, and recreation. Flooding and the resultant damages and epidemic threats will be significantly reduced. Water supply will contribute to the growth of the area. The lake will provide a needed recreational resource and increased fishing. About 8,000 acres will be permanently inundated. Fifty-four families living in the project area will need to be relocated as well as two cemeteries. Also, a state highway, several county roads, pipelines, powerlines, and telephone lines will need to be relocated. Some wildlife habitat will be lost and plant species composition will undergo some change. The alternatives include a combination of small lakes with a dry lake, levees, flood plain acquisition, flood plain management, and no action. (Sutton-Florida)
W74-09268

NEW MELONES LAKE STANISLAUS RIVER, CALIFORNIA: SUPPLEMENTAL DATA ON USE OF CONSERVATION YIELD (SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
Available from the National Technical Information Service, Springfield Va., 22151, as EIS-CA-73-0122-F. January 1973. 215 p, 1 chart, 3 tab, 2 append, 1 map.

Descriptors: *Environmental effects, *Reservoirs, *Surface waters, *Dams, *Flooding(Intentional inundation), Dam construction, Damsites, Water control, Backwater, Flood control, Water utilization, Riparian rights, Water supply, Water storage, Water transfer, *California.
Identifiers: *Environmental impact statement, *New Melones Lake(Calif.).

Project includes the construction of a dam and the creation of a large reservoir on New Melones Lake, Stanislaus River, California. It is to be a part of the Central Valley Project (CVP) and the water yield will be disposed of as part of the Central Valley Project operations. The project will recognize all water rights as well as the existing and projected requirements for water supplies in the local areas adjacent to the Stanislaus River, both upstream and downstream from New Melones Dam. Any excess water will be available for export to other CVP service areas. It is estimated that 285,000 acre-feet of water will be made available by New Melones Reservoir. It is suggested that the availability of these water supplies will encourage urban developers to move onto more valuable agricultural lands. There will be some loss of wildlife habitat and some removal of land from agricultural use for canal and other water conveyance structure sites. Including the release of the full conservation yield downstream, seven alternative uses of the water are discussed as well as the expected impacts on the service areas. (Conko-Florida)
W74-09269

PORT VERDIGRIS 33, INC., VERDIGRIS RIVER, OKLAHOMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
Available from the National Technical Information Service, Springfield, Va., 22151, as EIS-OK-73-0603-F. November 6, 1972. 27 p, 2 fig, 2 tab.

Descriptors: *Environmental effects, *Docks, *Channel improvement, *Navigation, *Industrial plants, Land use, Economic impact, Bulkheads, Piers, Excavation, Construction, Dredging, Navigable waters, Hazards, Safety factors, Agriculture, *Oklahoma.
Identifiers: *Environmental Impact Statements, *Port Verdigris(Okla.), *Navigation obstructions.

The project calls for the construction of a barge docking facility parallel to the navigation channels. The dock will be located on government property with the storage area located on adjacent private property. The off-channel location will decrease chances of vessel collisions. The excavated material will be placed ashore to raise the elevation of the storage area, thereby reducing the vegetative productivity of the land. The noise level will be raised due to the increase in traffic and commercial activity. Appearance of the area will change from rural to industrial. Two adverse effects are foreseen. One is the loss of the excavated land area for the dock and the other is the loss of agricultural productivity due to change in land use.

The only alternative considered was no development at all. (Conko-Florida)
W74-09270

BEAR CREEK PROJECT, TENNESSEE (FINAL ENVIRONMENTAL STATEMENT).
Tennessee Valley Authority, Chattanooga.
Available from National Technical Information Service Springfield, Va. 22151, as EIS-AL-73-0037-F. December 29, 1972. 248 p, 24 fig, 54 tab.

Descriptors: *Alabama, *Environmental effects, *Reservoirs, *Surface waters, *Dams, *Flooding(Intentional inundation), Dam construction, Damsites, Water control, Backwater, Flood control, Water utilization, Water supply, Water storage, Mussels, Streamflow, Watersheds(Basins), Floodways, Impoundments.
Identifiers: *Environmental Impact Statements, *Bear Creek(Ala).

Proposal is for the development of four reservoirs and four multiple-purpose dams in the Bear Creek watershed in northwest Alabama, and the construction of a nine-mile floodway. The environmental impacts will include shifts in land use in the project area, including the acquisition by the Tennessee Valley Authority (TVA) of 24,000 acres and the impoundment of some 69 miles of unregulated streams into four reservoirs. There will be unavoidable adverse effects on certain archaeological sites and on certain fish and wildlife areas, including a mussel bed containing a rare mussel species. The project will have an impact on stream-oriented ecosystems and certain water quality parameters as well as requiring the relocation of 68 families. Many of these losses will be offset or mitigated by the project. Alternative methods of providing water supply and flood control were considered, including alternative dam site locations. No alternative was found to be more feasible or to obtain the project purposes with less environmental impact. (Conko-Florida)
W74-09271

BUENA VISTA FLOOD PROTECTION PROJECT, BUENA VISTA, VIRGINIA (FINAL ENVIRONMENTAL STATEMENT),.
Army Engineer District, Norfolk, Va.
Available from National Technical Information Service, Springfield, Va. 22151, as EIS-VA-73-0336-F. December 1972. 49 p, 3 tab, 2 map.

Descriptors: *Virginia, *Environmental effects, *Surface waters, *Levees, *Flood control, *Flood ways, Water control, Water utilization, Water supply, Water transfer, Canals, Channels, Earthworks, Flood protection, Vegetation effects, Biota, Non-structural alternatives.
Identifiers: *Environmental Impact Statements, *Buena Vista(Va.).

The project consists of an 11,700 foot levee and floodwall, a 200-foot wide channel 2,800 feet long, a 5,700 foot interior drainage canal and three closures to provide flood protection. Construction will result in covering 65 acres of low use wildlife habitat, destruction of some associated vegetation in the excavation area as well as on the river bank adjacent to the channel and loss of benthic organisms in channel improvement areas. There will also be some relocation of businesses, utilities, and transportation facilities, and a favorable effect on the community resulting from flood protection. Other adverse effects are loss of bottom biota and temporary turbidity during construction and periods of flooding. The alternative proposals considered included no development at all, construction of an upstream reservoir, a 300-foot channel, non-structural measures, and combinations of these. (Conko-Florida)
W74-09272

MAINTENANCE DREDGING AND JETTY REPAIR, HAMPTON HARBOR, NEW HAMPSHIRE (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass.
Available from National Technical Information Service, Springfield, Va. 22151, as EIS-NH-73-0605-F. September 5, 1972. 56 p, 2 tab, 3 map.

Descriptors: *New Hampshire, *Environmental effects, *Dredging, *Navigable waters, *Sand bars, Aquatic life, Biota, Benthos, Channel improvement, Marine animals, Marine biology, Harbors, Oceans, Reefs, Shallow waters, Channels, Navigation, Recreation, Alternative planning, Obstructions to flow, Coasts.
Identifiers: *Environmental Impact Statements, *Hampton Harbor(N.H), *Coastal waters.

The project is for the removal of a sand bar across the outer portion of the entrance channel, and rehabilitation of the north jetty at Hampton Harbor, New Hampshire. The proposal includes removal of the sand bar on an annual basis thereafter. Approximately five to eight days are needed to remove the sand plus time for repairs to the jetty. Action will enable continued safe passage of recreational and commercial vessels through Hampton Harbor inlet. Adverse effects include temporary, localized damages to the marine biota, particularly non-burrowing, benthic forms, attributable to dredging and spoiling operations. No perdurable detriments to the ecology or beaches of Hampton Harbor area are foreseen from this action. Alternate methods of dredging and disposal are discussed as well as consideration of no action. (Conko-Florida)
W74-09273

MAINTENANCE DREDGING, CHATHAM (STAG E) HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass.
Available from National Technical Information Service, Springfield, Va. 22151, as EIS-MA-73-0604-F. July 12, 1972. 43 p, 2 tab, 3 map.

Descriptors: *Massachusetts, *Environmental effects, *Dredging, *Navigable waters, *Sand bars, *Sedimentation, Channel improvement, Marine animals, Harbors, Oceans, Reefs, Channels, Shallow waters, Coasts, Shoals, Silting, Sedimentation rates, Navigation, Obstruction to flow.
Identifiers: *Environmental Impact Statements, *Chatham Harbor(Mass.).

The proposal is for maintenance dredging in the lower portion of the 10-foot navigation channel of Chatham (Stag E) Harbor, Massachusetts. The proposed periodic dredging would take place from deep water in Chatham Roads and extend to the Harding Beach peninsula. Approximately 20,000 cubic yards of bottom sediment (sand) would be removed. If sidecast dredging is used, shoal material would be cast along the periphery of the channel. This will allow safe navigation into the harbor to continue. The local economy is dependent on harbor utilization, and the U.S. Coast Guard requires an open, navigable entrance into the harbor. No perdurable detriment to the natural resources of the harbor is expected and only temporary and localized damages are expected to occur in the work areas. The only alternatives are no dredging, or using another method of dredging such as hydraulic dredging which would spoil the sand in upland areas, or bucket dredging which would require dumping the sand offshore. (Conko-Florida)
W74-09274

REPORT OF PROCEEDINGS CONCERNING THE RECLASSIFICATION OF VARIOUS STREAMS IN NORTH CAROLINA, SECTION III, KINSTON PUBLIC HEARING MARCH 1, 1973.
North Carolina Board of Water and Air Resources, Raleigh.
July 1973. 230 p, 16 tab.

Descriptors: *River basin development, *River regulation, *Tributaries, *Water policy, *Water zoning, Water pollution control, Water quality control, Planning, Legislation, Watershed management, Water resources development, Drainage systems, Legal aspects, River systems, Rivers, River basin commissions, Classification, *North Carolina, Administrative agencies.

This report is the third in a series of three records of public hearings concerning state-wide proposals for upgrading the quality of surface waters in sixteen river basins by appropriate changes in their classification. This report contains copies of all materials, briefs, and letters presented, as well as the transcript of the proceedings, at the Kinston, North Carolina public hearing on March 1, 1973. Included are sections of the Laws of North Carolina relating to the policy of the state concerning its water resources and the assignment of classifications to surface waters within the state. Also included are the Rules Applicable to Classifications and Water Quality Standards adopted by the North Carolina Board of Water and Air Resources. Discussion at this hearing concerned the classification of streams in the Neuse River Basin, the Tar-Pamlico River Basin, the White Oak River Basin, the Pasquotank River Basin, the Chowan River Basin, and the Roanoke River Basin. (Craig-Florida)
W74-09275

REPORT OF PROCEEDINGS CONCERNING THE RECLASSIFICATION OF VARIOUS STREAMS IN NORTH CAROLINA, SECTION II, SOUTHERN PINES PUBLIC HEARINGS NOVEMBER 2, 1972.
North Carolina Board of Water and Air Resources, Raleigh.
July 1973. 278 p, 10 tab.

Descriptors: *River basin development, *River regulation, *Tributaries, *Water policy, *Water zoning, Water pollution control, Water quality control, Planning, Legislation, Watershed management, Water resources development, Drainage systems, Legal aspects, River systems, Rivers, River basin commissions, Classification, *North Carolina, Administrative agencies.

This is the second in a series of three records of public hearings concerning state-wide proposals for upgrading the quality of surface waters in sixteen river basins by appropriate changes in their classification. This report contains copies of all materials, briefs, and letters presented, as well as the transcript of the proceedings, at the Southern Pines, North Carolina public hearing on November 2, 1972. Included are sections of the Laws of North Carolina relating to the policy of the state concerning its water resources and the assignment of classifications to surface waters within the state. Also included are the Rules Applicable to Classifications and Water Quality Standards adopted by the North Carolina Board of Water and Air Resources. Discussion at this hearing concerned the classification of streams in the Yadkin-Pee Dee River Basin, the Lumber River Basin, and the Cape Fear River Basin. (Craig-Florida)
W74-09276

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES.
Water Resources Council, Washington, D.C.
38 Fed. Reg. 24778 (1973), 192p.

Descriptors: *Water resources development, *Watershed management, *Water quality control, *Water pollution control, *Water supply, Standards, Land resources, Water resources, Water demand, Water conservation, Long-term planning, Water quality, Water policy, Environmental effects, United States.

The Water Resources Council announces the establishment of Principles and Standards for Planning Water and Related Land Resources, pursuant to section 103 of the Water Resources Planning Act (P.L. 89-80). Several areas of revisions from the original Principles and Standards are set forth. These include planning objectives, the discount rate, retroactive application of the 'Grandfather Clause,' cost allocation, public participation and water quality evaluation. Further areas of revision include the use of economic projections, unemployed and under employed resources, the application of benefit to cost ratio, the preparing of feasible project alternatives, and the impact of benefits on income distribution. The Principles, Standards, and Procedures are discussed individually, analyzing each area's purpose and scope, objectives, beneficial and adverse impacts, general evaluation principles, its plan formulation, cost allocation, reimbursement and cost sharing, implementation procedure and its application and effect. The Standards cover almost every area of water and related land resources that have a major impact on society and were promulgated after extensive study and public response. The full texts of the Principles and Standards are published as a part of this notice. (See also W74-09279) (Sutton-Florida)
W74-09278

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES (FINAL ENVIRONMENTAL STATEMENT).
Water Resources Council, Washington, D.C.
Available from National Technical Information Service, Springfield, Va. 22151, as EIS-AA-73-1451-F. $3.00 in paper copy. September 4, 1973. 16p.

Descriptors: *Water resources development, *Water quality control, *Water supply, *Water conservation, *Water policy, United States, Legislation, Long-term planning, Discount rate, Cost allocation, Water resources, Land resources, Environmental effects, Water pollution control.

These Principles and Standards for Planning Water and Related Land Resources will supercede the present criteria, commonly known as Senate Document 97, 87th Congress 2nd session together with Supplement No. 1 (June 4, 1964), and the amendment of December 24, 1968, covering the discount rate. The Principles and Standards will be directed toward two objectives: national economic development and environmental quality. For each alternative plan, there will be a complete display or accounting of relevant beneficial and adverse effects on both objectives. These effects would be measured in monetary or quantitative units or terms appropriate to a particular effect. Also, for each alternative plan the effects on regional development and social well-being will be displayed where appropriate in the system of public information accounts. This system of accounts is summarized and the planning process is outlined. Cost allocation and reimbursement and program development are summarized. The evaluation process is set forth, and will provide for full display of all environmental impacts, favorable and adverse, as well as all irretrievable commitments of resources. (See also W74-09278) (Sutton-Florida)
W74-09279

REPLACEMENT OF THE AMERICAN FALLS DAM IN IDAHO, PART 1.
For primary bibliographic entry see Field 6E.
W74-09309

ANALYSIS OF THE RUN-OFF AND FLOW ROUTING FOR A MOUNTAIN GLACIER BASIN,
Moscow State Univ., (USSR).
For primary bibliographic entry see Field 2C.
W74-09328

WATER MOVEMENT THROUGH THE GORNERGLETSCHER,
Hull Univ., (England). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W74-09329

RECORD OF TWO JOKULLHLAUPS,
British Columbia Univ., Vancouver. Dept. of Geology.
For primary bibliographic entry see Field 2C.
W74-09331

SUBGLACIAL LEAKAGE OF SUMMIT LAKE, BRITISH COLUMBIA, BY DYE DETERMINATIONS,
Department of the Environment, Ottawa (Ontario). Inland Water Branch.
For primary bibliographic entry see Field 2C.
W74-09332

SOME VIEWPOINTS ON THE INTERNAL DRAINAGE OF GLACIERS,
Uppsala Univ. (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 2C.
W74-09333

INFLUENCE OF CHANGES IN THE GLACIERZED AREA ON SUMMER RUN-OFF IN THE PORTE DU SCEX DRAINAGE BASIN OF THE RHONE,
Eidgenoessfische Technishe Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau und Erdbau.
For primary bibliographic entry see Field 2C.
W74-09344

ESTIMATION OF RUN-OFF FROM ANTARCTIC AND GREENLAND ICE SHEETS,
Akademiya Nauk SSSR, Moscow. Vsesoyuznyi Institut Nauchnoi i Teknicheskoi Informatsii.
For primary bibliographic entry see Field 2C.
W74-09348

FLOOD PLAIN INFORMATION: OHIO RIVER, BROOKE COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, Pa.
Prepared for The Brooke County Planning Commission and the State of West Virginia, Department of Natural Resources, December 1971. 25 p, 14 fig, 6 tab, glossary.

Descriptors: *Flood plains, *Flood control, *Ohio River, Flood damage, *Flood profiles, Flood protection, *Flood frequency, Flood data, Locks, Dams, Gaging, Flood forecasting, Obstructions to flow, *West Virginia.
Identifiers: Brooke County(W. Va), Intermediate Regional Flood, Pike Island Locks and Dam(W. Va).

Brooke County is situated on the east bank of the Ohio River from Mile 64.75 to Mile 81.50 downstream of Pittsburgh, Pennsylvania. Wellsburg and Follansbee are the major towns with steel, sheet metal, tin, plate, coal, glass and plastic as principal industries. The Ohio River has a total drainage area of 203,940 square miles. Residences and industries have been built in the floodplain over the decades undeterred by recurring floods. Above Brooke County the Ohio River has a moderately wide floodplain and a relatively flat river gradient (a slope of 0.5 foot per mile for the report reach). In Brooke County there are no tributaries that have a significant effect on flood stages. Gage records have been kept from 1911 to the present. The main flood season is usually December through April. Flood duration is relatively long. The major obstruction to flood flows is the Pike Island Locks and Dam, which is equipped with gates allowing underpassage of flow. Fourteen upstream flood control projects operated by the Corps of Engineers are effective in reducing flood levels from 6 to 9 feet. No floodplain regulations or flood proofing building codes are now in effect in Brooke County. The most serious recorded flood for this area occurred on March 19, 1936, after 2 days for heavy rains. Wellsburg, suffering the greatest loss in Brooke County, was approximately three-fourths under water. Approximately one-fourth of Follansbee was flooded. A flood of only slightly lesser gravity came on December 31, 1942. Flood control dams prevented this disaster from surpassing the 1936 flood. On March 11, 1964 another major flood occurred. A projected Intermediate Regional Flood would have a peak discharge of 394,000 cubic feet per second with damage estimated at $6,000,000. (LaPointe-North Carolina)
W74-09354

FLOOD PLAIN INFORMATION; POCOTALIGO RIVER-TURKEY CREEK-CANE SAVANNAH CREEK-GREEN SWAMP-SHOT POUCH CREEK-ROCK BLUFF SWAMP, SUMTER COUNTY, SOUTH CAROLINA.
Army Engineer District, Charleston, S.C.
August 1972. 31 p, 57 fig, 7 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, Flood profiles, Flood damage, Peak discharge, Flood forecasting, Historic floods, Overflow, Flood profiles, Floodwater, *South Carolina.
Identifiers: Pocotaligo River(S.C.), Turkey Creek(S.C.), Cane Savannah Creek(S.C.), Green Swamp(S.C.), Shot Pouch Creek(S.C.), Rocky Bluff Swamp(S.C.), Sumter County(S.C.).

While properties along Pocotaligo River, Turkey Creek, Cane Savannah Creek, Green Swamp, Shot Pouch Creek, and Rocky Bluff Swamp vary from concentrated residential and commercial development to heavily wooded swampland, most of the floodplain is presently undeveloped. Areas which would be flooded by Intermediate Regional and Standard Project Floods are delineated on maps. During an Intermediate Regional Flood, peak flows along selected points range from 9,700 to 11,000 cfs on Pocotaligo River; from 4,940 to 6,500 cfs on Cane Savannah Creek; from 3,000 to 5,200 cfs on Green Swamp; from 5,170 to 5,340 on Rocky Bluff Swamp; from 1,300 to 3,820 on Turkey Creek; and from 1,680 to 2,965 on Shot Pouch Creek. During a Standard Project Flood, peak flows along selected points range from 16,050 to 18,000 cfs on Pocotaligo Creek; from 8,450 to 11,100 cfs on Cane Savannah Creek; from 5,120 to 8,900 cfs on Green Swamp; from 8,870 to 9,130 cfs on Rocky Bluff Swamp; from 2,070 to 6,000 cfs on Turkey Creek; and from 2,870 to 5,000 cfs on Shot Pouch Creek. Water velocity patterns are similar for all streams with channel velocities varying from 1 to 3 feet per second and overbank velocities rarely exceeding 2 feet per second. Pertinent structural elevations and water surface elevations are given for each of the 36 bridges and culverts that span the six streams. Water surface profiles of the Intermediate Regional and Standard Project Floods are also included. (Hoffman-North Carolina)
W74-09355

FLOOD PLAIN INFORMATION; WILKESBORO AND NORTH WILKESBORO, NORTH CAROLINA; YADKIN RIVER AND REDDIES RIVER.
Army Engineer District, Charleston, S.C.
January 1971. 51 p, 27 fig, 10 tab, glossary.

Descriptors: *Flood data, Flood profiles, *Design flood, *Regional flood, *Flow control, *Flood control, Flood damage, Flood forecasting, Historic floods, Overflow, Floodwater, Peak discharge, Dams, *North Carolina.
Identifiers: Yadkin River(N.C.), Reddies River(N.C.), W. Kerr Scott Dam(N.C.), Reddies River Dam(N.C.), Wilkesboro(N.C.).

Above Wilkesboro and North Wilkesboro, the Yadkin River drains an area of 493 square miles, including the 96 square mile drainage basin of the Reddies River. W. Kerr Scott Dam, located on the Yadkin River 5.5 miles above Wilkesboro, controls the runoff from 348 square miles. The Reddies River, presently uncontrolled, is capable of producing a serious flood. Congress has authorized a multi-purpose project for the Reddies River basin. Under proposed future conditions, W. Kerr Scott Dam and the Reddies River Dam will both fully control the Intermediate Regional Flood at their respective sites. An Intermediate Regional Flood could result from rainfall concentrated over the 50.5 square mile drainage area between Wilkesboro and the two damsites. Neither dam could fully control a Standard Project Flood: W. Kerr Scott Dam would allow a peak outflow of 29,000 cfs and the Reddies River Dam would allow a peak outflow of 10,500 cfs. Under existing conditions peak discharges during an Intermediate Regional Flood would be 61,500 cfs on the Yadkin River and 36,200 cfs on the Reddies River. An Intermediate Regional Flood would flood 1,294 acres, including 250 structures along the Yadkin River and 95 acres, including 19 structures, along the Reddies River. A Standard Project Flood would flood 1,673 acres, including 368 structures, along the Yadkin River and 180 acres, including 33 structures, along the Reddies River. Regulation by the Reddies River project would reduce the respective areas of coverage by approximately 14%. Water surface profiles under existing conditions and with regulation by the proposed Reddies River Dam are included. (Hoffman-North Carolina)
W74-09356

FLOOD PLAIN INFORMATION; KIT AND NORTHEAST CREEKS; RESEARCH TRIANGLE AREA, DURHAM AND WAKE COUNTIES, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
June 1973. 20 p, 10 fig, 15 plates, 5 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, Flood damage, Peak discharge, Flood forecasting, Overflow, Flood profiles, Floodwater, *North Carolina.
Identifiers: Kit Creek(NC), Northeast Creek(NC), Research Triangle Area(NC).

The Research Triangle Area, a 5,000 acre tract located between the University of North Carolina at Chapel Hill, North Carolina State University at Raleigh, and Duke University in Durham, is being developed for industrial and governmental research and development facilities. At present with 5% of the land developed, 75% woodland, and 20% agricultural, only highway bridges and a few buildings would be affected by flooding. Since no flood discharge or stage records are available for Kit or Northeast Creeks, flood potential was extrapolated from data on regions of like topography and watershed cover. Total drainage area of Northeast Creek and North Prong, a tributary, is approximately 34 square miles; total drainage area for Kit Creek, 10.2 square miles. Development in the lower reach is precluded by present construction of New Hope Lake Project. As the Triangle expands the flood plain will come under increasing pressure for commercial development. A Standard Project Flood would flood 1,029 acres, including 13 structures along Northeast Creek, 110 acres, including 5 structures along North Prong Northeast Creek and 426 acres along Kit Creek and Branch South. An Intermediate Regional Flood would flood 813 acres, including 4 structures along Northeast Creek, 82 acres, including 1 structure along North Prong Northeast Creek, and 328 acres along Kit Creek and Branch South. Underclearance elevation, lowest elevation of roadway, and water surface elevation during Intermediate Regional Floods and Standard Project Floods are detailed for all bridges and culverts. Photographs indicate possible levels of future flooding. (Hoffman-North Carolina)
W74-09357

FLOOD PLAIN INFORMATION; REEDY RIVER, RICHLAND CREEK, GREENVILLE COUNTY, SOUTH CAROLINA.
Army Engineer District, Charleston, S.C.
April 1972. 42 p, 20 fig, 28 plates, 7 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, *Flood profiles, Flood damage, Peak discharge, Flood forecasting, Overflow, Floodwater, Historic floods, *South Carolina.
Identifiers: Reedy River(SC), Richland Creek(SC), Greenville County(SC).

Properties along Reedy River and Richland Creek vary from intense urban development in downtown Greenville, where past floods have caused considerable damage to homes and industries, to woodland and pastureland in the reaches north and south of town. It is expected that future urban expansion will increase development on the floodplain, thus magnifying the effect of flooding. Reedy River and Richland Creek generally rise swiftly during floods and remain out of their banks for at least 24 hours. Velocities of main channel flow would vary from 3 to 9 feet per second during an Intermediate Regional Flood, with velocity of flow slightly higher during a Standard Project Flood. Peak flows along selected points on Reedy River range from 3,300 to 13,000 cfs during an Intermediate Regional Flood and from 7,500 to 27,300 cfs during a Standard Project Flood. Peak flows along selected points on Richland Creek range from 2,380 to 3,500 cfs during an Intermediate Regional Flood and from 5,440 to 8,000 cfs during a Standard Project Flood. Underclearance elevation, lowest elevation of roadway, and water surface elevation during Intermediate Regional and Standard Project Floods are detailed for the 49 bridges and culverts that span the two streams. Overflow areas are delineated on maps. Water surface profiles of Intermediate Regional and Standard Project Floods are also included. (Hoffman-North Carolina)
W74-09358

GENERAL PLAN FOR RECOMMENDED STORM DRAINAGE FACILITIES, MARION COUNTY, OHIO.
Brown (Floyd G.) and Associates, Ltd., Marion, Ohio.
For primary bibliographic entry see Field 5D.
W74-09359

ENVIRONMENTAL CONSIDERATIONS FOR WATER MANAGEMENT DISTRICT 6 OF COLLIER COUNTY,
Collier County Conservancy, Inc., Naples, Fla.
For primary bibliographic entry see Field 6B.
W74-09360

RAIN FLOOD DISCHARGE IN NORTHEASTERN SLOPES OF KOPET-DAG (USSR), (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
B. T. Kirsta.
Probl Osvoeniya Pustyn'. 2. p 32-38, 1973, Illus, English summary.
Identifiers: *Flood discharge, Irrigation, Permeability, Rain floods, Slopes, Soils, *USSR(Kopet-Dag), Water sources.

The number of floods varies from 1-15/yr. They occur annually in drainage systems consisting of soil very impermeable to water. It is more advantageous to use flood waters for replenishment of underground water resources. Therefore stable irrigation of vast areas is lacking.--Copyright 1974, Biological Abstracts, Inc.
W74-09365

PROGRESS REPORT ON THE EFFECT OF GROUND-WATER CONDITIONS ON LOCAL FLOODING IN THE KINGSTON AREA, PA.,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-09366

THE COOPER RIVER ENVIRONMENTAL STUDY.
For primary bibliographic entry see Field 2L.
W74-09379

VASCULAR PLANT SURVEY OF MARSH AND ADJACENT HIGHLAND IN SELECTED PORTIONS OF COOPER RIVER AND WANDO RIVER,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 2L.
W74-09382

THE VEGETATION OF THE COOPER RIVER ESTUARY,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 2L.
W74-09383

WATER QUALITY PORTION OF THE COOPER RIVER ENVIRONMENTAL STUDY.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W74-09385

SURFACE WATER HYDRAULICS.
For primary bibliographic entry see Field 2L.
W74-09387

HIGHWAYS AND THE CATASTROPHIC FLOODS OF 1972.
Highway Research Board, Washington, D.C.
For primary bibliographic entry see Field 2E.
W74-09390

FLOODS OF 1972,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W74-09391

WEATHER SITUATIONS ASSOCIATED WITH FLOODS DURING 1972,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2E.
W74-09392

HURRICANE AGNES-DAMAGE IN PENNSYLVANIA,
Pennsylvania State Dept. of Transportation, Harrisburg.
For primary bibliographic entry see Field 2E.
W74-09393

FLOOD DAMAGE IN SOUTH DAKOTA,
South Dakota State Dept. of Highways, Pierre.
For primary bibliographic entry see Field 2E.
W74-09394

FLOODS IN MINNESOTA,
Minnesota State Highway Dept., Minneapolis.
For primary bibliographic entry see Field 2E.
W74-09395

OBSERVATIONS ON THE CAUSES OF BRIDGE DAMAGE IN PENNSYLVANIA AND NEW YORK DUE TO HURRICANE AGNES,
Federal Highway Administration, Washington, D.C. Office of Engineering and Traffic Operations.
For primary bibliographic entry see Field 2E.
W74-09396

RECORDING FLOODS AND FLOOD DAMAGE,
Geological Survey, Reston Va.
W. Hofmann.
Highway Research Record, No 479, p 40-41, 1973.

Descriptors: *Flood data, *Data collections, *Hydrologic data, Basic data collections, Floods, Peak discharge, Stream gages, Surveys, State-discharge relations, Flood frequency, Flood recurrence interval.

The Geological Survey has the responsibility for recording the state, discharge, and areal extent of floods. Major floods are documented by collecting data in the field and then by reporting the data so that they are available to those who need the information. The areal extent of the flooding is delineated through field surveys and photogrametrically. At gauge sites, continuous water stages and periodic discharge measurements are collected. (See also W74-09390) (Knapp-USGS)
W74-09397

PROBABILITY DISTRIBUTION OF EXTREME FLOODS,
Geological Survey, Reston, Va.
C. H. Hardison.
Highway Research Record, No 479, p 42-45, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Floods, *Probability, *Historic floods, *Flood frequency, *Flood recurrence interval, Statistics, Statistical methods, Flood data, Flood forecasting, Frequency analysis.

Two aspects of the unusually large floods experienced in 1972 are discussed: how such large floods affect the computation of the 50-year peak and how these floods plot on a probability distribution of extreme floods based on analysis of 157,000 annual peaks at about 200 stream gauging stations. Weight factors are given to be used in computing 50-year peaks both with and without extreme floods included. For 10 of the stations affected by the 1972 floods associated with Hurricane Agnes, the use of the recommended Log-Pearson Type III (LPT3) procedure with observed peaks through 1972 results in 50-year peaks that average three times as large as the 50-year peaks computed without including the Agnes floods. Even when generalized logarithmic skew coefficients were substituted for the sample skew coefficients in the LPT3 computations, the 50-year peaks at these 10 stations averaged about 80 percent larger with the Agnes floods than they did without. When an annually high flood is included in an array of flood peaks, computation of the 50-year peak by the LPT3 procedure should use a generalized skew coefficient and considerable weight should be given to the 50-year peak computed with the highest peak deleted from the array. Extension above the 50-year peak should be a straight line on log probability paper to about the 1,000-year probability level, but the slope should be based in part on the average slope at all stations in the area. Floods that are more than two standardized units above the 50-year peak are so rare that their exceedance probability (less than one in 4,000) is comparable to that for damage caused by other natural disasters such as earthquakes, landslides, and tornadoes. (See also W74-09390) (Knapp-USGS)
W74-09398

DESIGN CRITERIA AND RESEARCH NEEDS,
Hydrologic Engineering Center, Washington, D.C.
V. Hagen, W. Hofmann, F. L. Johnson, S. V. Fox, and B. M. Reich.
Highway Research Record, No 479, p 54-64, 1973. 2 fig.

Descriptors: *Design flood, *Flood forecasting, *Bridges, *Highways, Roads, Disasters, Risks, Design, Planning.

The occurrence of an extreme flood event, such as Hurricane Agnes, requires careful review of flood prevention activities. Flood events in excess of the design flood will occur somewhere each year. It is not possible, because of money constraints, to build all structures to pass the biggest flood that might happen in that location. So, the only answer appears to be to build highways so that extensive damage will not occur, either to the highway or to other property. (See also W74-09390) (Knapp-USGS)
W74-09400

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION: VOLUME 7. EARTHQUAKE HISTORY AND MEASUREMENT WITH APPLICATION TO THE LAKE MICHIGAN DRAINAGE BASIN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 2H.
W74-09407

THE EFFECTS OF LAND USE ON SALMON PRODUCTION,
Alaska State Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 4C.
W74-09411

ENVIRONMENT: A NEW FOCUS FOR LAND-USE PLANNING.
National Science Foundation, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.95. Report NSF/RA/E-74-001, October 1973, 328 p (Edited by Donald M. McAllister).

Descriptors: *Land use, *Urbanization, *Environment, *Comprehensive planning, Suburban area, *Research priorities, *Land management, Economics, Evaluation, Governmental interrelations, Institutions.

This book is divided into four parts. Part I presents the recommendations of high-priority research for land-use planning and allocation that were developed by the workshop participants. Part II contains an introductory chapter and historical overview of land-use planning in the United States. Part III comprises a collection of nine papers devoted to various topics concerning the social, economic, and natural environmental factors important to environmental/land-use planning. They were prepared in advance of the conference to serve as background papers for the work at the conference. Part IV contains six committee reports which were prepared during the conference. (See W74-09413 thru W74-09421)
W74-09412

THE FUTURE OF THE URBAN HABITAT,
California Univ., Los Angeles.
For primary bibliographic entry see Field 6E.
W74-09413

LAND-USE INSTITUTIONS IN THE WASHINGTON-BALTIMORE REGION-A MIRROR FOR METROPOLITAN AMERICA,
Carnegie Institution of Washington, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-09414

LAND-USE RESEARCH ISSUES SUGGESTED BY A NATIONAL URBAN GROWTH STRATEGY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Urban Studies and Planning.
L. Rodwin, and L. Susskind.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 127-142, October 1973. 24 ref.

Descriptors: *Urbanization, *Land use, *Planning, *Research priorities, *Federal government, Coordination, State government, Local government, City planning, Management.
Identifiers: Urban growth strategy, Metropolitan decentralization.

Federal inactivity in developing a national growth policy has left a severe vacuum in attempts to organize metropolitan growth, to develop lagging regions, and to establish ethnic autonomy. State and local governments, however, have had and will continue to have a major role in implementing a national urban growth strategy. Certain research implications merge from such a strategy. First, what kind of incentives and on what scale can they be established to produce significant effects in metropolitan growth. Second, can a few growth centers be established to focus new regional development, and can assistance be provided for the populations of regions where development is infeasible. Thirdly, since racial and ethnic considerations will become a major factor in land use planning, what new characteristics and options must be considered. Concrete research problems include the assessment of the impact of urban growth strategies, linking decentralization of major urban areas to the promotion of lagging regions, the use of the new town device as a reinforcement of urban growth centers, and employing the powers of state governments to implement urban growth strategies and to address environmental concerns. There is a pressing need for a coordinated set of national policies so that lower level, day to day, administrative decisions can be justified by a meaningful set of principles. (See also W74-09412) (LaPointe-North Carolina)
W74-09415

CONFLICTS IN LAND USE,
Ross, Hardie, O'Keefe, Babcock, McDugald and Parsons, Chicago, Ill.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 143-155, October, 1973.

Descriptors: *Legal aspects, *Land use, *Land development, *Research priorities, Zoning, Local governments, Equitable apportionment, Benefits, Costs, Migration, Administration.
Identifiers: No-growth policies, Housing, Urban design, Miami Valley Region(Ohio), Boulder(Colo.), San Bernadino(Calif.), Ramapo(N.Y.).

Most debates over public policy on land use involve relationships between three parties: (1) the owner of the land; (2) the local government directly concerned over the development of the land; (3) those interests which may be affected by decisions made by either of the first two parties. Useful legal solutions need to be developed that would redistribute benefits and liabilities between public expenditures and private development of land. Legalization of urban design is also a problem. Public decision makers are faced with a system of land-use regulation based upon Euclidean zoning employing rigid rules for lot size criticized as encouraging sterile design, or Planned Unit Development allowing greater flexibility in design. Additional legal techniques of land-use regulation need to be developed to provide alternatives to static solutions possible through zoning and encourage more diversity of housing, commercial uses, and population mix. The Miami Valley Region (Ohio) and San Bernardino Region are areas that have tackled the problem of distributing the burden of low cost housing among all constituent communities. Communities like Boulder, Colo. and Ramapo, N.Y., that have established no growth policies will need to consider whether they can achieve ecological goals and simultaneously provide needed low cost housing and related services. Consideration must also be given to whether planning and implementation at the regional or state level is impaired. Future conflicts may arise

out of the present policy of open migration, construction of megastructures, and concepts of the family where the modular of the traditional family unit may be replaced by communal living or other forms of relationships. (See also W74-09412) (LaPointe-North Carolina)
W74-09416

ECONOMIC POLICIES, ENVIRONMENTAL PROBLEMS, AND LAND USE,
California Univ., Riverside.
For primary bibliographic entry see Field 6B.
W74-09417

AN EVALUATION OF THE IMPACT OF LAND USE ON ENVIRONMENTAL QUALITY,
Argonne National Lab., Ill. Center for Environmental Studies.
E. J. Croke.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 217-231, October, 1973. 1 tab, 14 ref.

Descriptors: *Land use, *Evaluation, *Environment, *Planning, Air pollution, Water pollution, Clean Air Act, Federal Water Pollution Control Act, Land development, Standards, River basin development, Federal jurisdiction, Institutions, Regional development.
Identifiers: Assimilative capacity, National standards.

Recent federal legislation such as the Federal Clean Air Act (1970) and the Water Pollution Control Act have mandated pollution control plans reflecting the spatial distribution of pollutant sources for metropolitan regions and river basins. Such plans would necessitate the substitution of a comprehensive land use policy for the present technologically oriented pollution control strategy which is seriously hampered by rapid development. Any environmental land use policy would have to consider the relationship between the assimilative capacity of an area and environmental quality standards. For example, large quantities of toxic industrial wastes may be contaminating New Jersey groundwater due to an inability to assimilate the wastes. Lake Tahoe and Atlanta are cited as two areas where regional development plans have included constraints due to assimilative capacity. Current national environmental strategy, however, tends to disregard the particular assimilative capacities of different areas by establishing national emission and environmental quality standards. Current land development policy, with projects having a 25-30 year economic lifetime can often lead to socioeconomic irreversibility of the consequent environmental problems. Highway systems, airports, and the land development and population distribution they engender are cases in point. In order to insure the inclusion of environmental control in land use decisions by states and localities the federal government has a wide variety of incentives and disincentives at its disposal including the withholding of granting of funds for transportation systems, water treatment facilities and energy distribution systems. (See also W74-09412) (LaPointe-North Carolina)
W74-09419

PLANNING FOR AREAS OF SIGNIFICANT ENVIRONMENTAL AND AMENITY VALUE,
California Univ., Berkeley. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6B.
W74-09420

UNIVERSITY RESEARCH AND PRACTICE: AN INSTITUTIONAL CONFRONTATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6E.
W74-09421

MANAGEMENT OF LANDS USED FOR WASTE DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W74-09424

FULL-SCALE HARVEST OF AQUATIC PLANTS: NUTRIENT REMOVAL FROM A EUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W74-09438

THE EFFECTS OF WATER FLOW MANIPULATION BELOW THE HYDROELECTRIC POWER DAM ON THE BOTTOM FAUNA OF THE UPPER KENNEBEC RIVER, MAINE,
Maine Cooperative Fishery Unit, Orono.
For primary bibliographic entry see Field 5C.
W74-09462

WATER PROBLEMS IN THE ARID WESTERN REGIONS OF THE USA, (IN RUSSIAN),
I. S. Zonn.
Probl Osvoeniya Pustyn'. 2. p 39-48. 1973. Illus. English summary.
Identifiers: Agriculture, *Arid lands, Cloud seeding, Ground water depletion, Irrigation, *Water utilization, *Western U.S., Desalination, Saline water, Thermal water, Inter-basin transfer.

In the western USA the available water resources are utilized completely, and in arid regions lack of water is considerable. Ground water is depleted primarily by agricultural irrigation. Investigations are under way to enable more economical use of the available water resources (cloud seeding, desalinization of saline underground and sea waters, utilization of thermal waters, and intra- and inter-basin water transference.)--Copyright 1974, Biological Abstracts, Inc.
W74-09469

ANALYTICAL MODEL FOR MANAGEMENT OF ALLUVIAL AQUIFERS,
Colorado Dept. of Natural Resources, Denver. Div. of Water Resources, Planning and Investigations.
For primary bibliographic entry see Field 4B.
W74-09477

USE OF DECISION THEORY IN RESERVOIR OPERATION,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
S. O. Russell.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper No 10586, p 809-817, June 1974. 3 fig, 6 ref.

Descriptors: *Canada, *Demand, *Forecasting, Hydraulics, *Multiple-purpose reservoirs, *Reservoir operation, Methodology, Lakes, Flow, Snowmelt, Runoff, Discharge(Water), Water levels, Flood control, Storage, Irrigation water, Water supply, Systems analysis, Mathematical models, *Risks.
Identifiers: Rule curves, *Decision theory, Bayes' theorem, Subjective probability, Okanagan Lake(British Columbia-Canada), Utility curve, Decision tree.

A method is presented for deciding how to most efficiently operate a multipurpose reservoir which is subject to conflicting demands. The method is based on decision theory and can be used to derive reservoir rule curves when flow forecasts are unavailable or to provide guidance in real time on what is best to do when forecast information is available. Because of the complexity of the real situation, the Bayes' theorem cannot be applied formally--decision theory cannot be applied directly. However, the underlying approach is believed to be 'Bayesian' in that it uses subjective probability estimates of future inflows obtained from the hydrologist, a utility curve obtained from the decision maker, and it seeks to maximize expected utility at all times. A special bridge between theory and practice has been devised. The procedure is illustrated by application to the Okanagan Lake in British Columbia, a lake which is operated as a reservoir for both flood control and storage of water for irrigation purposes. The method does not eliminate the need for experience and judgement on the operator's part, but be making the process explicit it should help the decision maker in using all the available information in a rational and consistent way. (Bell-Cornell)
W74-09478

WATER AND LAND SLIDES,
Paul Sabatier Univ., Toulouse (France). Lab. of Botany and Biogeography.
M. M. Lorilland.
Bull Soc Hist Nat Toulouse. Vol 108, No 1/2, p 248-254, 1972. Illus.
Identifiers: Climates, *France(Garonne-Ariege rivers), *Land slides, Maintenance, Rocks, Soils, Stream, Vegetation.

Observations and experimentation on land slides in the vicinity of the Garonne and Ariege Rivers were carried out at Toulouse-Pouvourville, Vieille-Toulouse, Portet-sur-Garonne, Lacroix-Falgarde and Goyrans, France. Related factors include terrain, geological, topographical, pedological and climatic conditions. The rock of the region is of the Marn-Molasse type, with intercalated veins and lentils of clay and sand. The veins and sandy lentils permit infiltration and subterranean circulation of waters arising from stream action, which diminishes the resistance of the rock to unfavorable forces. A talus at the foot of the hill, which is often directly bathed by river water, is an outlier of slide phenomena. The main climatological concerns are conditions of excessive winter and spring rains, which affect pedological conditions, and are the essential determining agent in slides; and summer drought which does not eliminate the instability created by the precipitation, and which harms protective vegetation. Studies carried out in 1959-1969 revealed a relationship between slides and the amount of precipitation of the preceding months. Most slides occurred at the end of spring, after accumulation of winter and spring rains. Slides occurring in late autumn or early winter are more easily explained on the basis of the imbibement of high river waters. Swollen rivers due to melting mountain snow in the spring are undoubtedly an important factor in slide production. Topographical factors (maintenance of the natural vegetation cover) are also important.--Copyright 1974, Biological Abstracts, Inc.
W74-09485

EXPERIMENTAL FIELD STUDIES REQUIRED FOR THE DESIGN OF DRAINAGES, (STUDII EXPERIMENTALE IN TEREN, NECESARE PROIECTARII DRENAJELOR),
A. Wehry.
Hidrotehnica, Vol 18, No 11, p 586-589, November, 1973. 2 ref.

Descriptors: Engineering structures, *Drainage systems, *Drainage engineering, Irrigation ditches, Lateral conveyance structurs, Model studies, *Mathematical studies.
Identifiers: *Hooghoudt's method, *Ernst's method.

Calculation methods necessary for conducting experimental field studies before designing drainage systems are presented. Presented are views of the drainage structures, pressure loss representation, the nomogram for calculating the value according to Hooghoudt, the ground water level representation during and after irrigation and the experimen-

tal value H=f(t) representation. In order to calculate the distance between drains, Hooghoudt and Ernst's methods are most often used. In order to apply the nomograms, it is necessary to know hydraulic conductivity of the earth layer. This value can be obtained only by a field study. Also, porosity and drainage intensity must be known. Equations are provided for various field situations and examples of calculations are given. (Urbanski - FIRL)
W74-09495

RAIN RESERVOIRS AND RAIN OVERFLOWS (REGENBECKEN UND REGENENTLASTUNGEN),
W. Muntz.
Gas-Wasser-Abwasser, Vol 53, No 9, p 293-300, September, 1973. 7 fig, 1 tab, 7 ref.

Descriptors: *Rainfall-runoff relationships, *Rainfall intensity, Rain, Rates, Runoff, Sewers, *Watersheds(Basins), Canals, Treatment, *Waste water treatment.

Problems of the design and dimensioning of rain reservoirs and rain overflows are discussed. Canal overflows without rain reservoirs serve to release stormwater directly into the recipient whenever a critical throughflow is reached. Rain overflow basins bypassing the wastewater treatment facility assume a similar role, while rain overflow basins connected in series with the wastewater treatment facility serve to protect the latter to preserve its purifying capacity. Rainwater retention basins retain stormwater for subsequent treatment. While most stormwater overflow basins are currently designed for a minimum critical rain intensity of 15 liter/sec, this critical value should be now increased to 25-30 liter/sec, and even to 40-50 liter/sec for especially protected recipients and for water capture areas. Rain reservoirs should be designed for flow times of 5 to 15 minutes. Increased flow time results in increased reservoir volume per ha, and in reduced final pollutant concentration. Attenuation of the initial pollutant load peak in watershed areas was determined. (Takacs-FIRL)
W74-09509

BETTER STORM DRAINAGE FACILITIES--AT LOWER COST,
For primary bibliographic entry see Field 5D.
W74-09513

ALUMINUM PIT DOORS PROVIDE EASY ACCESS TO A RETENTION BASIN.
For primary bibliographic entry see Field 5D.
W74-09515

MANAGING WATER RESOURCES FROM THE WRONG PLACE AT THE WRONG TIME,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 6B.
W74-09528

PREVENTING LANDFILL LEACHATE CONTAMINATION OF WATER,
Gulf South Research Inst., Baton Rouge, La.
For primary bibliographic entry see Field 5G.
W74-09539

THE INFLUENCE OF DRAW-DOWN ON RECREATION ON THE TRENT CANAL RESERVOIR-LAKES,
Toronto Univ. (Ontario). Faculty of Forestry.
R. Jaakson.
Water Resources Bulletin, Vol 9, No 6, p 1225-1233, 1973. 4 ref.

Descriptors: *Water level fluctuations, *Duty of water, *Recreation, *Jurisdiction, *Drawdown, Effects, Attitudes, Reservoirs, Competing uses, Legal aspects, Political aspects, Canals, Planning, Multiple-purpose projects, Decision making, Water utilization, Water rights, Riparian rights, Shores, *Canada.
Identifiers: *Trent Canal(Ontario).

The multiple purposes of many water related projects are often conflicting. The Trent Canal in Ontario, Canada, a 240-mile recreational waterway of canals, navigable lakes, and rivers, provides a unique opportunity to study two conflicting water uses, both involving recreational activities. The Canadian Federal government currently manages the 44 adjacent lake-reservoirs as water storage sites to augment the canal's flow. The major recreational users of the lakes are cottage owners while boaters are heavy consumers of recreational activity on the canal. Drawdowns, sometimes to the level of 13 feet, to maintain boating create negative externalities to cottage owners. Twelve of the 44 lakes were chosen as study sites with three water bodies outside the region used as controls. In depth interviews with 5% of cottage owners on the lakes--115--to examine the impact of drawdown were conducted. Results indicate that previously hypothesized values of the externalities were exaggerated, with drawdowns on infrequently dry years only likely to cause a significant impact. Owners were found to readily adapt to changes in water levels, thereby not leading to a severe curtailment of recreational activity. Shoreline physiography of cottage sites was shown to significantly affect owners' reaction to the drawdowns. (Schroeder-Wisconsin)
W74-09555

ECOLOGICAL RIVER BASIN MANAGEMENT,
National Parks and Conservation Association, Washington, D.C.
A. W. Smith.
The Environmental Journal, Vol 46, No 3, p 1-4, 1972.

Descriptors: *Ecology, *Environmental effects, Dams, Watershed management, Reservoirs, *River basin development, Irrigation, *Flood plain zoning.

The address by the President and General Counsel of the National Parks and Conservation Association presented before the 1971 Seventh American Water Resources Conference contends that the major objectives of water resources management, and specifically river basin management, as currently practiced by government agencies and regulated utilities in the United States are outmoded and destructive. The focus of criticism is the big dam and the concomitant reservoir, for over 75 years the basic tool in river basin management. The failure of this tool for irrigation, water supply, flood control, hydroelectric power, and pollution abatement programs is examined. Of even greater concern, in addition to the failure of the big dam and reservoir to achieve goals set by river basin planners, is the ecological damage created by these structures. Farm land is reduced by inundation, communities, homes, churches, cemeteries, and historical sites or buildings have been destroyed or forced to relocate. Alternatives to the big dam concept exist. Included in those discussed are flood plain zoning, small local reservoirs, and pollution abatement at the source. (Schroeder-Wisconsin)
W74-09559

SIMULATION CRITERIA FOR SELECTING WATER RESOURCE SYSTEM ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 6A.
W74-09567

A GENERAL PURPOSE SIMULATION MODEL FOR ANALYSIS OF SURFACE WATER ALLOCATION USING LARGE TIME INCREMENTS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 6A.
W74-09568

AN EXPERIMENTAL STUDY OF DRAINAGE BASIN EVOLUTION AND THE INFLUENCE OF LANDFORMS ON HYDROLOGIC VARIABLES,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
S. A. Schumm, and R. S. Parker.
Available from NTIS, Springield, Va. 22151 as AD-767 284, Price $2.75 printed copy; $1.45 microfiche. Final contract report to Army Research Office Report, September 1, 1973. 17 p, 2 fig, 2 tab. DA-ARO-D-31-124-70-G13.

Descriptors: *Geomorphology, *Model studies, *Hydraulic models, Erosion, Channel morphology, Topography, Rainfall-runoff relationships, Drainage patterns(Geologic), Sediment yield.

To study drainage evolution, a scale model was designed and constructed at Colorado State University during 1970. During two experimental seasons, (summer 1971, 1972) the evolutionary development of small drainage systems was documented by photography and mapping. The response of the drainage systems to baselevel change was recorded, and during the evolution of the systems, from inception of the drainage patterns, through maximum growth to eventual reduction of drainage density, hydrologic data were collected. These data have been related to the changing morphology of the evolving drainage system. (Knapp-USGS)
W74-09586

A GENERAL PURPOSE EVENT WATER-LEVEL RECORDER,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 7B.
W74-09604

GEOLOGY AND QUALITY OF WATER IN THE MODESTO-MERCED AREA, SAN JOAQUIN VALLEY, CALIFORNIA, WITH A BRIEF SECTION ON HYDROLOGY,
Geological Survey, Menlo Park, Calif.
R. W. Page, and G. O. Balding.
Geological Survey Water-Resources Investigations 6-73, September 1973. 85 p, 28 fig, 12 tab, 67 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *California, Geology, Hydrologic data, Hydrogeology, Aquifer characteristics, Water wells, Well data, Water yield, Streamflow, Geomorphology, Surface-groundwater relationships, Water utilization, Water supply, Irrigation, Chemical analysis.
Identifiers: *San Joaquin Valley(Calif), *Modesto-Merced area(Calif).

The Modesto-Merced area, California, includes about 1,800 square miles on the northeast side of the San Joaquin Valley. The physiographic units in the area are (1) Sierra Nevada, (2) dissected uplands, (3) low alluvial plains and fans, (4) river flood plains and channels, and (5) overflow lands. At least three groundwater bodies occur in the area: (1) the unconfined water body, (2) the confined water body, and (3) the water body in consolidated rocks. Groundwater in the unconfined water body generally is moderately hard east of U.S. Highway 99 and hard to very hard west of Highway 99. However, a corridor of moderately hard water is present west of U.S. Highway 99 along the Merced River. Water in the confined water body ranges from soft to very hard. Surface

water in the area differs in chemical quality because of differences in size and location of drainage basins, amounts of precipitation, types of rocks in drainage basins, spills from irrigation water and industrial and domestic development along a given river or stream. The few analyses of water from minor streams indicated that the water was of a bicarbonate type and that it was comparable to or better than that in the major rivers. Water from major rivers ranged in chemical type from calcium bicarbonate to sodium chloride. (Woodard-USGS)
W74-09605

RIVER REGULATIONS AS INFLUENCE ON PEAK DISCHARGE,
International Engineering Co., Inc., Denver, Colo. Barton, Stoddard, Milhollin and Higgins Div.
A. F. Huggins, and M. R. Griek.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10671, p 901-918, July 1974. 11 fig, 7 tab, 5 ref, 2 append.

Descriptors: *Peak discharge, *Regulation, *Flood control, *Reservoirs, *Colorado River, Colorado, Regulated flow, Diversion, Design flood.

River regulation materially affects the magnitude of peak flood discharge in a river basin. Peak flow in the upper Colorado River basin is primarily from snowmelt runoff. The first significant regulation occurred in 1936 with the inauguration of the Moffat Tunnel and in 1942 with the completion of Green Mountain Dam. Three analytical approaches were used to determine the amount of reduction in peak flow resulting from regulation. Utilizing river flow data during the years 1900-1968, a 50-yr flood flow of 31,000 cfs was computed whereas the series 1942-1968 yields 22,800 cfs, a 30% flow reduction, Regional analysis of adjacent watersheds indicated a 10% reduction attributed to climatic conditions. An analysis of tributaries in the basin indicated a 20% reduction in unit contribution resulting from controls. These approaches gave support for the recommendation of a design flow reduced 20% from the peak discharge computed over the longer period of record. (Knapp-USGS)
W74-09617

COMPARISON OF FOUR NUMERICAL METHODS FOR FLOOD ROUTING,
Hydraulics Research Station, Wallingford, (England).
For primary bibliographic entry see Field 2E.
W74-09621

OPTIMAL DESIGN FOR HIGHWAY DRAINAGE CULVERTS,
Meta Systems, Inc., Springfield, Va.
G. K. Young, M. R. Childrey, and R. E. Trent.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10676, p 971-993, July 1974. 13 fig, 5 tab, 30 ref, 2 append.

Descriptors: *Design flow, *Culverts, Economics, *Virginia, Highways, Hydraulics, Risks, Probability, Hydraulic design.

Economic risks are directly considered in an optimal design procedure for box culverts. Flood related losses are computed on a probabilistic basis to derive economic risks for box culvert design. The components of the economic risk are damage to upstream property, damage to the embankment and roadway, and damage to the culvert. An optimal design is reached when the construction costs plus the economic risks are minimum. The design procedure was applied to 22 sites on stream crossings in Virginia. Based on this economic risk procedure, curves were developed which suggest variable return period criteria for conventional design practice. For the conventional situations, construction cost savings on the order of 50% are indicated for the reinforced concrete barrels of the optimal design. (Knapp-USGS)
W74-09630

GEOHYDROLOGY OF CROW CREEK AND LOWER BRULE INDIAN RESERVATIONS, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-09638

ASSESSING VISUAL-CULTURAL VALUES OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6B.
W74-09651

COMPUTER MODELING APPLICATIONS IN URBAN WATER PLANNING,
Denver Board of Water Commissioners, Colo.
For primary bibliographic entry see Field 6A.
W74-09654

ALTERNATIVE SOLUTIONS TO WATER RESOURCE DEVELOPMENT--A CASE STUDY,
Texas A and M Univ., College Staztion. Water Resources Inst.
For primary bibliographic entry see Field 6B.
W74-09661

DATA ACQUISITION AND COMBINED SEWER CONTROLS IN CLEVELAND,
Cleveland Dept. of Public Utilities, Ohio.
For primary bibliographic entry see Field 5D.
W74-09716

FLOOD RUNOFF SYSTEMS WITH COLLECTOR CHANNEL AND FAST DISCHARGE FOR DAMS (VOLGYZAROGATAK GYUJTOCSATORNAS, SURRANTOS ARAPASZTOI),
For primary bibliographic entry see Field 8A.
W74-09720

REALIZATION OF THE DANUBE FLOOD PROTECTION PROJECT FOR VIENNA (DAS WERDEN DES PROJEKTES FUER DEN DONAU-HOCHWASSERSCHUTZ VON WIEN),
A. Grzywienski.
Osterreichische Ingenieur-Zeitschrift, Vol 16, No 11, p 379-385, November, 1973. 4 fig, 45 ref.

Descriptors: *Flood protection, Dams, Flood recurrence interval, Channels, *Flood control, Flood routing.
Identifiers: *Austria(Vienna), *Danube River.

The flood protection project being constructed in the Vienna, Austria, area is described. The dams will be elevated, and double protection will be consequently built up around Vienna to meet floods occurring at an estimated frequency of one in every 10,000 years. A flood release channel diverts up to 5,000 cu meters water per second whenever the yield in the Danube exceeds 5,000 cu m/sec. The areas around Vienna not belonging to the urban agglomeration will have a flood protection system designed for a flood frequency of one in every 1,000 years. (Takacs-FIRL)
W74-09739

DYNAMICS OF FOREST, MEADOW AND SWAMP VEGETATION IN CONNECTION WITH RECLAMATION (BASED ON STUDIES IN BELORUSSIA), (IN BYELORUSSIAN),
For primary bibliographic entry see Field 2I.
W74-09746

TUNNELS MAY STORE STORMWATER FOR LATER TREATMENT.
For primary bibliographic entry see Field 5D.
W74-09749

DELAYS IN THE OPERATION OF SUBSURFACE DRAINAGE TRENCHING MACHINES,
Quebec Ministere de l'Agriculture et de la Colonisation, Buckingham.
For primary bibliographic entry see Field 8C.
W74-09794

DRAINAGE INVESTIGATIONS AND FINDINGS ON THE GOTVAND PROJECT - IRAN,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 2G.
W74-09797

OPTIMIZING SURFACE IRRIGATION UNIFORMITY BY NONUNIFORM SLOPES,
CH2M-Hill, Redding, Calif.
For primary bibliographic entry see Field 3F.
W74-09800

4B. Groundwater Management

GROUND WATER QUALITY AND SOLID WASTE MANAGEMENT-- A SELECTIVE BIBLIOGRAPHY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5E.
W74-09319

UNDERGROUND INJECTION OF WASTEWATERS IN THE OHIO VALLEY REGION.
Ohio River Valley Sanitation Commission, Cincinnati. Committee on Subsurface Industrial Wastewater Injection,
For primary bibliographic entry see Field 5G.
W74-09324

GROUND-WATER DATA, 1972, INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. L. Banta.
Open-file report, August 1973. 12 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Water levels, *Groundwater, *California, Data collections, Hydrologic data, Water wells, Drawdown, Withdrawal.
Identifiers: *Indian Wells Valley(Calif).

Water-level measurements were made in about 110 wells in Indian Wells Valley, California, in October 1972. The average water-level declined 3.5 feet in six wells between October 1971 and October 1972. The total pumpage from Indian Wells Valley during 1972 was about 15,200 acre-feet, an increase of about 6 percent over 1971. Water samples were collected from 67 wells in Indian Wells Valley in 1972 for chemical analysis. Principal constituents determined in the analyses are listed. (Knapp-USGS)
W74-09352

WATER BALANCE IN SEWAGE STABILIZATION LAGOONS,
North Dakota Univ., Grand Forks. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-09361

PROGRESS REPORT ON THE EFFECT OF GROUND-WATER CONDITIONS ON LOCAL FLOODING IN THE KINGSTON AREA, PA.,
Geological Survey, Harrisburg, Pa.
D. J. Growitz.
Open-file report, December 1973. 4 p, 1 fig, 1 tab.

Descriptors: *Water levels, *Groundwater, *Pennsylvania, *Water level fluctuations, Data collections, Hydrologic data, Hydrogeology, Flooding.
Identifiers: *Kingston(Penn).

An observation-well network and surface-water measuring points were established to monitor fluctuations of groundwater and surface-water levels near Kingston, Pennsylvania. Water-level elevations of both surface water and groundwater are generally highest in the spring and lowest in the fall. The objectives of this study are to determine the source and movement of groundwater and the seasonal fluctuation in groundwater levels in order to delineate areas in and adjacent to Kingston where basement flooding occurs and to determine the severity of the flooding. In addition, factors that control the surface and subsurface routing of water are to be determined, so that methods to alleviate flooding can be proposed and evaluated. (Knapp-USGS)
W74-09366

GEOLOGIC ASPECTS OF LANDFILL REFUSE DISPOSAL,
Louisville Univ., Kentucky. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-09375

WATER SUPPLY EVALUATION AND PROPOSED COMPREHENSIVE STUDY OF THE CHARLESTON-BUSHY PARK INDUSTRIAL COMPLEX, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 2L.
W74-09389

WATER-TABLE FLUCTUATION IN RESPONSE TO RECHARGE,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W74-09409

SOIL CLOGGING DURING INFILTRATION OF SECONDARY EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-09467

ANALYTICAL MODEL FOR MANAGEMENT OF ALLUVIAL AQUIFERS,
Colorado Dept. of Natural Resources, Denver. Div. of Water Resources, Planning and Investigations.
R. Qazi, and J. Danielson.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR2, Paper no 10627, p 143-152, June 1974. 5 fig, 1 tab, 4 ref.

Descriptors: *Alluvial aquifers, *Wells, *Pumping, *Water management(Applied), *Simulation analysis, *Computer models, Groundwater, Flow, Water table, Reservoir storage, Recharge, Rivers, Surface waters, Conjunctive use, Water delivery, Water supply, Damages, Drawdown, Canals, Irrigation water, Municipal water, Computer programs, Equations, Evaluation, Systems analysis, *Colorado.
Identifiers: Stream depletion, Water augmentation, South Platte River(Colo.), Algebraic summation.

Under the doctrine of prior appropriation, the recent inclusion of wells in the existing priority system of water rights in Colorado has created new problems for water management in tributary alluvial aquifers. Irrigation and municipal wells, generally subordinate to surface water rights on a river, are subject to complete shut down if they cannot compensate for the river depletion due to pumping; to shut these wells off could mean economic disaster to large rural areas in Colorado. Therefore, augmentation plans have been accepted by the Division of Water Resources whereby well owners must provide for river depletion in both time and space either by recharge operations or by direct deliveries to the river from acquired surface water. To evaluate these plans, an analytical approach using computer simulation has been derived to estimate the change in storage of the groundwater and the rate and amount of movement of water to and from the river. The model, presented in detail, can provide quick estimates of the volumetric movements and the fluctuation of the water table due to any combination of wells, recharge lines, or pit operations in an alluvial (unconfined) aquifer. Model applications to the South Platte River in Colorado, and results, are discussed. Compared to other conjunctive use models, this does not require voluminous amounts of input data. (Bell-Cornell)
W74-09477

OPERATION AND MAINTENANCE OF WELLS,
Stamm-Scheele, Inc., Rayne, La.
For primary bibliographic entry see Field 8G.
W74-09524

CORRELATION BETWEEN TURBIDITY AND IRON CONTENT OF THE FILTER EFFLUENT OF WELL ORIGIN,
Yugoslav Dept. of Water Treatment Plant Automation, Belgrade.
For primary bibliographic entry see Field 5B.
W74-09526

MANAGING WATER RESOURCES FROM THE WRONG PLACE AT THE WRONG TIME,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 6B.
W74-09528

(WATER WELL CONTRACTOR SURVEY).
Water Supply Management, Barrington, Ill. 1971, 21 p, 59 tab.

Descriptors: Wells, *Groundwater, *Surveys, Publications, Statistical methods, Estimating, Investigations, *Drilling, *Water wells, Irrigation wells, *Well data.
Identifiers: Domestic wells, Industrial wells, Waste disposal wells, Livestock supply wells.

A profile is presented of the driller market with regard to 6,100 water well contractors, and their buying habits, their attitudes about products and well industry issues, and the types of wells they drilled in 1969. Buying habits and attitudinal material are presented as national composite figure only; a breakdown into nine geographical areas allow regional information to also be reported for well numbers, depths and diameters drilled, rigs used, pumps installed, and casing and screening used per well type. Data are reported for the following well types: municipal; industrial; domestic; livestock supply; irrigation; sprinkler system; air conditioning system supply; waste disposal; other miscellaneous types of wells. A 10 per cent national reply was received, and served as the basis for projections on well numbers nationally and for each area. (Martino-NWWA)
W74-09529

GROUND-WATER CONDITIONS CAUSED BY TROPICAL STORM AGNES,
Susquehanna River Basin Commission, Mechanicsburg, Pa.
J. R. Hollowell.
Pennsylvania Geology, Vol 2, No 5, p 2-9, April 1974. 7 fig.

Descriptors: *Groundwater, *Flood damage, Building codes, Hydrographs, Hurricanes, Water level fluctuations.
Identifiers: *Groundwater flooding, *Susquehanna river basin, *Tropical storm Agnes.

Hydrographs from U.S. Geological Survey observation wells in the Susquehanna River Basin were analyzed to determine ground-water response to tropical storm Agnes. The amount and intensity of the rainfall associated with the tropical storm was sufficient to create all-time high water levels in most of the observation wells. Four hydrographs are presented to show how topography was a major factor in the water-level fluctuations caused by the tropical storm. From these data the geologic and topographic settings subject to ground-water flooding were recognized and delineated. (Staplin-NWWA)
W74-09532

O AND M COSTS: PAY NOW OR PAY LATER,
National Water Well Association, Houston, Tex. Research Facility.
M. D. Campbell, and S. N. Goldstein.
Water Well Journal, Vol 28, No 2, p 26-27, 66-68, February 1974.

Descriptors: *Operation and Maintenance, *Rural areas, Management, Economics, Wells, *Operating costs, *Maintenance costs.
Identifiers: Water systems, Cost efficiency, Support companies, Well longevity.

The operation and maintenance of rural water systems is discussed in terms of economics and availability to rural residents. National Demonstration Water Project (NDWP) is now experimenting with a regional management approach to operation and maintenance that is designed to provide low-cost, dependable service to rural areas. NDWP affiliate projects are forming support companies that provide operation and maintenance services such as: (1) billing and collecting, (2) sampling and testing, (3) contracting, (4) inspecting facilities and water quality and (5) providing consulting and training programs. A cost breakdown showing the amount spent on operation and maintenance for a typical small rural company is given. Routine operation and maintenance procedures will often extend the life of a rural water system resulting in a long term savings in the total cost of the system. (Staplin-NWWA)
W74-09533

WATER WELL DESIGN FOR EARTHQUAKE-INDUCED MOTIONS,
Bechtel Power Corp., Los Angeles, Calif.
For primary bibliographic entry see Field 8B.
W74-09535

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
J. T. Johnson, and J. Thrailkill.
Journal of Hydrology, Vol 20, No 4, p 327-333, December 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Wells, *Water wells, *Groundwater, Aquifers, Statistical methods, *Limestone, Geology, Beds(Stratigraphic), Hydrology, Areal hydrogeology, Stratigraphy, Lithology, Water supply, Water pollution, Saline water, *Kentucky.
Identifiers: *Centerville Quadrangle(Ky), Synclines, Anticlines, Non-parametric tests.

Ten variables were examined using non parametric statistical tests (Mann-Whitney U and chi square) to evaluate the influence of these variables on ground water supply in the Centerville Quadrangle, Kentucky. Variables found to be significant were those directly related to lithology (wellhead stratigraphy and well-bottom stratigraphy) and those interpreted as being strongly influenced by lithology (well depth, wellhead elevation, and

well-bottom elevation). In addition, wells judged adequate for water supply were closer to surface streams and bottomed closer to stream level than dry holes. Adequate wells were also closer to synclinal axes than dry holes. There was no significant difference between dry holes and adequate wells in their distance from sinkholes or regional structural position. Wells producing H2S-containing water differed from adequate wells only with regard to variables related to lithology but salinewater wells were more abundant in areas distant from surface streams as well as in unfavorable lithology. (Martino-NWWA)
W74-09543

PROBLEMS RELATED TO THE EVALUATION OF GROUNDWATER RESOURCES OF THE CRYSTALLINE ROCK AREA, SAN DIEGO COUNTY, CALIFORNIA,
California State Univ., San Diego. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W74-09544

TWO TESTS FOR THE CLUSTER WELL CONCEPT,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
For primary bibliographic entry see Field 8A.
W74-09549

GROUNDWATER QUALITY. DOOR COUNTY, WISCONSIN.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-09565

SUBSURFACE DISPOSAL OF PICKLE LIQUOR,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5E.
W74-09583

GROUNDWATER POLLUTION.
For primary bibliographic entry see Field 5B.
W74-09590

SEPTIC TANKS AND GROUNDWATER POLLUTION,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W74-09593

GROUNDWATER POLLUTION BY AGRICULTURE,
Louisiana Tech. Univ., Ruston. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-09595

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
Eastern New Mexico Univ., Portales. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-09596

HYDRAULIC TESTING AND SAMPLING OF HOLES RB-E-01 AND RB-D-01, PROJECT RIO BLANCO, RIO BLANCO COUNTY, COLORADO,
Geological Survey, Lakewood, Colo.
J. E. Weir, Jr.
Available from NTIS, Springfield, Va. 22151 - Price $3.00 printed copy; $1.45 microfiche. Contract Report USGS-474-150, (Rio Blanco-1) for US Atomic Energy Commission, November 1972. 28 p, 6 fig, 2 tab, 3 ref. USAEC Contract AT(29-2)-474.

Descriptors: *Aquifer testing, *Water yield, *Water wells, *Colorado, Aquifers, Confined water, Water levels, Transmissivity, Hydrogeology, Hydrologic data, Sampling, Water quality.
Identifiers: *Rio Blanco County(Colo).

The discharge of water was monitored during drilling of two holes (RB-E-01 and RB-D-01) at the Rio Blanco site in western Colorado. Recovery of water level was measured following periods of water withdrawal from hole RB-D-01. Two intervals of hole RB-D-01 were tested. Zone 1, from 245 to 845 feet below land surface, has a transmissivity of about 4,600 gallons per day per foot and a static water level of 59.90 feet below land surface. Zone 2, from 882 to 1,651 feet below land surface, has a transmissivity of about 200 gallons per day per foot and a static water level of 39.63 feet below land surface. There is potential at hole RB-D-01 for flow of water upward from zone 2 to zone 1; however, differences in quality of water in the two zones indicate that water probably does not circulate freely between the zones. (Knapp-USGS)
W74-09601

GEOLOGY AND QUALITY OF WATER IN THE MODESTO-MERCED AREA, SAN JOAQUIN VALLEY, CALIFORNIA, WITH A BRIEF SECTION ON HYDROLOGY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W74-09605

OPTIMAL PUMPING FOR AQUIFER DEWATERING,
Stanford Univ., Calif. Dept. of Geology.
E. Aguado, I. Remson, M. F. Pikul, and W. A. Thomas.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10639, p 869-877, July 1974. 5 fig, 1 tab, 3 ref, 2 append.

Descriptors: *Dewatering, *Mathematical models, *Drawdown, Linear programming, Excavation, Withdrawal, Groundwater movement, Drainage engineering, Finite element analysis.

A method is presented for determining the optimal well locations and steady-state pumping scheme for dewatering a construction site. It uses the finite-difference approximations of the groundwater differential equation as constraints in a linear programming model. The method was used to determine optimal well distributions and steady-state pumping patterns for dewatering a dry dock excavation site. Because the method is restricted to steady-state solutions, auxiliary use was made of the transient numerical model to predict dewatering times. Solutions of alternate optimization problems may be achieved readily. For example, it might be desirable to restrict the number of wells or restrict their locations. It might be desirable to consider economic factors. Such solutions may be achieved with modifications of constraints or objective functions. (Knapp-USGS)
W74-09620

GEOHYDROLOGY OF CROW CREEK AND LOWER BRULE INDIAN RESERVATIONS, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-09638

OUTLINE OF THE HYDROGEOLOGY OF SIBERIA (OCHERKI PO GIDROGEOLOGII SIBIRI).
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 2F.
W74-09641

PRESENT STATE AND PROSPECTS OF GROUNDWATER USE FOR WATER SUPPLY OF POPULATED AREAS IN IRKUTSK OBLAST (SOSTOYANIYE I PERSPEKITIVY ISPOL'ZOVANIYA PODZEMNYKH VOD DLYA VODOSNABZHENIYA OBZHITOY CHASTI IRKUTSKOY OBLASTI),
Institut Zemnoi Kory, Irkutsk (USSR).
R. F. Ivanilova.
In: Ocherki po gidrogeologii Sibiri; Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, p 53-57, Novosibirsk, 1973.

Descriptors: *Groundwater, *Water utilization, *Water supply, *Human population, *Urbanization, Cities, Water wells, Rocks, Geologic time.
Identifiers: *USSR(Irkutsk Oblast).

The Irkutsk Oblast has vast supplies of fresh groundwater suitable for use. Various organizations in the Oblast have drilled more than 2,000 boreholes for water, about 1,800 of which are being exploited. The number of wells in the Oblast is 15,400, and the number of springs is over 200. Usable groundwater can be found in deposits of varying ages, ranging from young Quaternary to ancient Archean, inclusive. Conditions are favorable for obtaining fresh groundwater in the Irkutsk, Kachug, Nizhneudinsk, Tayshet, and Tulun Rayons. In almost all populated areas in these regions fresh groundwater occurs at depths rarely exceeding 100 m, and well productivity averages 0.5 to 10 liters/sec at slight drawdown. Less favorable are water-supply conditions in the Zalari, Kuytun, Ust'-Uda, Cheremkhovo, Alarskiy, Bokhan, and Ekhirit-Bulagatskiy Rayons, where fresh groundwater is either nonexistent or exploratory work and exploitation conditions are difficult. Water supply conditions are also unfavorable in populated areas removed from the zone of inundation of the Bratsk Reservoir. Cities in the Irkutsk Oblast which have a centralized water supply are Irkutsk, Angarsk, Shelekhovo, Usol'ye-Sibirskoye, Cheremkhovo, and Bratsk. Water supply of these cities has until now been entirely based on surface waters, although attempts have been made to use groundwater. Outside these cities water supply is decentralized and is based mainly on surface waters and waters of Quaternary deposits, the quality of which, in most coses, fails to meet water-quality standards. Groundwater of bedrock is being used in small towns and urban settlements. Exploratory work is underway to convert the population of the Oblast to use of groundwater for its water supply. (See also W74-09641) (Josefson-USGS)
W74-09643

PRESENT STATE AND PROSPECTS OF USE OF THERAPEUTIC MINERAL WATERS IN THE IRKUTSK OBLAST (SOSTOYANIYE I PERSPEKTIVY ISPOL'ZOVANIYA LECHEBNYKH MINERAL'NYKH VOD IRKUTSKOY OBLASTI),
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 2K.
W74-09644

PROBLEMS OF HYDROGEOLOGIC INVESTIGATIONS IN THE EASTERN PART OF THE USSR IN 1971-75 (ZADACHI GIDROGEOLOGICHESKIKH ISSLEDOVANIY NA VOSTOKE SSSR NA 1971-1975 GG),
Institut Zemnoi Kory, Irkutsk (USSR).
S. G. Beyrom, N. M. Bogatkov, Ye. V. Pinneker, B. I. Pisarskiy, and O. N. Tolstikhin.
In: Ocherki po gidrogeologii Sibiri; Komissiya po Izucheniyu Podzemnykh Vod Sibiri i Dal'nego Vostoka Materialy, No 6, p 120-130, Novosibirsk, 1973.

Descriptors: *Investigations, *Exploration, *Hydrogeology, *Groundwater, *Groundwater resources, Aquifers, Areal hydrogeology, Natural resources, Water conservation, Water pollution, Water quality, Mineralogy, Water types, Distribution patterns, Estimating, Evaluation, Forecasting.
Identifiers: *USSR(Siberia), Soviet Far East.

Basic problems of hydrogeologic investigations in Siberia and Soviet Far East in 1971-75 were discussed in a paper presented at the Sixth Conference on Groundwater of Siberia and Soviet Far East, held in Khabarovsk in October 1970. These problems included: (1) estimation of natural groundwater resources by large hydrogeologic regions; (2) complex hydrogeologic investigations in oil- and gas-bearing regions and study of groundwater distribution patterns in deep horizons; (3) study of groundwater distribution patterns in the zone of aeration in areas of hydraulic construction, reclamation, and irrigation, and forecasting of changes resulting from man's engineering activities; (4) evaluation of the state of inundation of hard mineral deposits and improvement of hydrogeologic prospecting techniques; and (5) investigations on conservation of groundwater and its protection from depletion and contamination. (See also W74-09641) (Josefson-USGS)
W74-09647

ANTIMONY IN GROUNDWATER OF THE KADAMDZHAY DEPOSIT (SUR'MA V PODZEMNYKH VODAKH KADAMDZHAYSKOGO MESTOROZHDENIYA),
Tomsk Polytechnic Inst. (USSR).
N. M. Shvartseva.
Akademiya Nauk SSSR Doklady, Vol 207, No 5, p 1220-1222, 1972. 1 fig, 1 tab, 13 ref.

Descriptors: *Geochemistry, *Water chemistry, *Mineralogy, *Groundwater, Water types, Water sampling.
Identifiers: *USSR(Kadamdzhay deposit), *Antimony, Antimonite, Mineralization.

Distribution of antimony in water was investigated at the surface and in joints, solution openings, and fracture zones of the Kadamdzhay antimony depost. Antimony was found in all water samples in relatively large concentrations. Its concentration in water related to ore mineralization does not exceed 128 micrograms/liter, whereas that in water unrelated to ore mineralization reaches 5,750 micrograms/liter, averaging 2,845 micrograms/liter. High antimony concentrations in neutral and mildly alkaline waters of the Kadamdzhay deposit show that antimonite is readily dissolved under specific conditions, possible under the influence of autotrophic organisms. This promotes widespread leaching of antimony beyond the deposit and formation of aqueous dispersion halos in the Shakhimardan River, where the antimony concentration decreases gradually away from the deposit. The size of these aqueous dispersion halos reaches 1.5 km. (Josefson-USGS)
W74-09648

4C. Effects On Water Of Man'S Non-Water Activities

FLOOD SURVEY AT PROPOSED TAPS CROSSING OF YUKON RIVER NEAR STEVENS VILLAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
J. M. Childers, and R. D. Lamke.
Open-file report, 1973. 12 p, 4 fig, 1 tab, 7 ref.

Descriptors: *Floods, *Alaska, *Pipelines, Scour, Stage-discharge relations, Design flood, Historic floods, Erosion, Surveys.
Identifiers: *Trans-Alaska Pipeline, *Yukon River(Alas).

A flood survey and a hydraulic analysis were made at the proposed pipeline and highway bridge crossingof the Yukon River, Alaska. The Maximum Evident Flood at the proposed crossing, section 6, was 890,000 cu ft per sec at an elevation of 301 feet. The Standard Project Flood (or design flood), at 1,600,000 cu ft per sec, will reach an elevation of 322 feet at the proposed crossing. No ice-jam evidence was found. No significant scour or fill occurs at high flow. (Knapp-USGS)
W74-09405

THE EFFECTS OF LAND USE ON SALMON PRODUCTION,
Alaska State Dept. of Fish and Game, Juneau.
S. C. Smedley, K. E. Durley, and C. C. Larson.
Available from NTIS, Springfield, Va 22151 as COM-73-10895 Price $3.00 printed copy; $1.45 microfiche. Completion Report to National Marine Fisheries Service, July 1972, 82 p.

Descriptors: *Salmon, *Lumbering, *Water pollution effects, *Land use, Land management, *Alaska, Fisheries, Forestry, Forest management.

To assess the effects of land use (primarily logging) in Alaska on the salmon spawning environment, a monitoring program was initiated in 1963. Three major salmon streams, capable of handling escapements of 100,000 or more pink salmon per year, were chosen. These are Staney Creek and 108 Creek (also known as Big Creek) on the Kasaan District of the South Tongass National Forest and Kadashan Creek, Sitka District, 1968, North Tongass National Forest. Seven years of monitoring in 108 Creek of (1) adult pink salmon escapement, (2) streambed composition, (3) streambed stability, and (4) production of pink salmon fry, show a drop in adult escapements, marked increase of fine materials in the spawning grounds, a relatively stable streambed, a drop in pink salmon fry production, and a rise in percentage fry survival between eyed eggs and pre-emergence when adult spawners are relatively sparse. Equally important, these affects have been noted in a stable, lake-fed stream where logging and road building have been conducted under careful supervision. No careless practices have been tolerated. Land use was apparently unrelated to the initial drop in odd-year adult pink salmon runs and fry production. The drought year 1965 seems the primary cause of depression. High salmon egg deposition plus a high percentage of fine materials in 1964 and particularly in 1966 presumably created a BOD too high to be met, resulting in low fry survival and eventually a low 1968 adult return. Contributions of sediment to 108 Creek through small tributary streams were identified as coming from the road system and from logs skidding over and breaking tributary streambanks. Slumps in unlogged areas from the banks of 108 Creek also contributed significant suspended sediment load. A significant (1.3 to 1.4 deg F) increase in water temperature was found in the summer of 1966 and 1967 when compared with water temperatures of summers, 1964 and 1965. This increase might be ascribed to logging. (Knapp-USGS)
W74-09411

ROAD SALT, DRINKING WATER AND SAFETY,
Little (Arthur D.), Inc., Cambridge, Mass. Public Affairs Center.
R. C. Terry.
Ballinger Publishing Company, Cambridge, Mass. 1974. 159 p.

Descriptors: *Sodium chloride, Water quality, *Salt, *Ice, Snow, *Potable water, Deicers, Safety, Public health.
Identifiers: *Road salt, *Deicing.

An analysis is provided of the rapidly emerging health problems and medical concern over levels of sodium in both public and private water supplies which can be traced directly to de-icing practices. The development of the various winter road policies are reviewed, and the difficulties of present water quality standards are evaluated. A detailed discussion of the many variables which cause problems in setting reasonable salt-use policies is presented, and recommendations for local community programs and state-wide legislation are offered. (Martino-NWWA)
W74-09537

SOME POTENTIAL ENVIRONMENTAL PROBLEMS FROM POPULATION EXPLOSION AND URBAN DEVELOPMENT IN MASSACHUSETTS AND ADJACENT PARTS OF NEW ENGLAND,
Massachusetts Univ., Amherst. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-09598

4D. Watershed Protection

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09278

AN EVALUATION OF THE IMPACT OF LAND USE ON ENVIRONMENTAL QUALITY,
Argonne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 4A.
W74-09419

ESTIMATION OF WASHLOAD PRODUCED ON CERTAIN SMALL WATERSHEDS,
New York State Univ., Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-09618

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

LASER RAMAN SPECTROSCOPY OF SOLUTES DISSOLVED IN WATER FROM A REMOTE PLATFORM,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown.
Available from the National Technical Information Service as PB-233 432, $3.00 in paper copy, $1.45 in microfiche. Completion Report, (1974). 17 p, 6 fig, 1 tab, 3 ref. OWRR B-036-RI(4). 14-31-0001-3641.

Descriptors: Pollutants, *Remote sensing, *Pollutant identification, *Spectroscopy, Oil pollution, Sodium, Solutes, Aqueous solutions, *Anions.
Identifiers: *Laser raman spectroscopy, *Sodium salts.

An optical system for obtaining remote Raman spectra of ionic solutes dissolved in water has been built and tested. At present, the system has been used to detect and identify 150 ppm of No3- at a distance of 21 ft. Furthermore, the same system has been used to detect oil slicks on the surface of water.
W74-09255

MERCURY LEVELS IN FISH FROM SELECTED WISCONSIN WATERS (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison. Bureau of Research.
S. J. Kleinert, and P. E. Degurse.
Research Report 73, 1971. 16 p, 1 fig, 3 tab, 15 ref.

Descriptors: *Mercury, *Fish, *Wisconsin, Data collections, Poisons, Path of pollutants, Public health, Industrial wastes.

Elevated levels of mercury were found in Wisconsin fish in sections of the Chippewa, Flambeau, and Wisconsin Rivers. Seventy-one percent of all samples testing over 0.5 ppm mercury and 95% of all fish testing over 1.0 ppm mercury in this Survey came from these three rivers. Elsewhere in Wisconsin, levels of individual fish samples sometimes approach or exceed 0.5 ppm mercury, but the average mercury level is below 0.5 ppm. (Knapp-USGS)
W74-09371

CHARLESTON AREA SEDIMENT SAMPLES,
South Carolina Pollution Control Authority, Columbia.
H. E. Gibson.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 105-118, April 1974. 7 fig, 4 ref, 1 append.

Descriptors: *Bottom sediments, *Estuaries, *South Carolina, Oxygen demand, Nitrogen, Oil, Mercury, Lead, Zinc, Sampling, Data collections, Pollutant identification.
Identifiers: *Charleston Harbor(SC), *Cooper River(SC).

Samples of sediment were collected in Charleston Harbor during August 1972 and delivered to Laboratory Services. Analyses were made between September and December. Volatile solids, chemical oxygen demand, total kjeldahl nitrogen, oil and grease, mercury, lead, and zinc were determined. (See also W74-09379) (Knapp-USGS)
W74-09386

SURVEY OF ENVIRONMENTAL RADIOACTIVITY, (JANUARY 1973-DECEMBER 1973).
Minnesota Dept. of Health, Minneapolis.
Available from NTIS, Springfield, Va., as COO-651-90 for $3.00 paper copy; $1.45 microfiche. Report No. COO-651-90, April 1974. 61 p, 8 fig.

Descriptors: *Surveys, *Minnesota, *Radioactivity, *Nuclear powerplants, *Effluents, *Data collections, Water pollution, Precipitation(Atmospheric), Surface waters, Sewers, Milk, Iodine, Cesium, Strontium, Radioisotopes, Public health, Rivers, Sampling, Analytical techniques.
Identifiers: *Elk River.

A surveillance program of the state of Minnesota includes the Elk River Reactor site during the dismantling of the Elk River Reactor. A considerable increase in radioactivity in all media analyzed occurred in the middle of 1961 due to fallout from nuclear weapons testing. The peak for gross beta activity in Minnesota surface waters was reached early in 1963. A peak for air particulates was reached in the latter half of 1961, followed by a second peak early in 1963. From 1963 to 1965, the general trends of radioactivity in precipitation, surface waters and air have been downward. Since 1965, levels of radioactivity in these media have generally stabilized. The activity in processed fluid milk reached a peak for iodine-131 in 1962. Since late 1963, iodine-131 in samples analyzed has been less than the minimum practical reporting limit of ten. Peaks for cesium-137 and strontium-90 occurred in processed fluid milk during 1963 and 1964, respectively. After a rapid downward trend, cesium-137 levels have stabilized. Levels of strontium-90 in processed fluid milk stabilized after a more prolonged period of decline than that observed for cesium-137. Detailed description of survey methods and sampling locations are included. (Houser-ORNL)
W74-09431

PESTICIDE ANALYSIS IN WATER,
Environmental Protection Agency, Springfield, Ill.
J. T. Hurley.
Journal of the American Water Works Association, Vol 66, No 1, p 27-31, January, 1974. 12 fig.

Descriptors: Instrumentation, Chromatography, *Gas chromatography, *Measurement, *Pesticides, *Chlorinated hydrocarbons, Organophosphorus pesticides, Carbamate pesticides, Herbicides, Water pollution, *Pollutant identification, Municipal wastes, *Potable water, Water supply.
Identifiers: Phenoxy herbicides.

The detection and analysis of pesticides in drinking water supplies are discussed. Pestides can be divided into several classes according to their chemical structure as follows: chlorinated hydrocarbon pesticides, organophosphorus pesticides, carbamates, and phenoxy herbicides. In investigating the levels and types of pesticides in water, it is important to know toxicity, extent of usage, persistence in the environment, biomagnification, and sensitivity of detection. The chlorinated insecticides are one of the most important groups. They are widely used, toxic to mammals, persistent, have a long half-life, and undergo biomagnification, ultimately being stored in the fatty tissue of the body. The gas chromatograph system consists of five parts: pressure regulator and flowmeter for the carrier gas, sample-injection system, a column, a detector, and a recorder. It is sensitive, selective, and suitable for determining pesticide levels in water. (Merritt-FIRL)
W74-09484

COMPARING EFFLUENT RELEASES FROM NUCLEAR AND FOSSILFUELED POWER PLANTS,
Brookhaven National Lab., Upton, N.Y. Health Physics and Safety Div.
For primary bibliographic entry see Field 5B.
W74-09503

TRACE METAL CONTAMINANTS.
Dimensions/NBS, Vol 57, No 10, p 244-245, October, 1973. 2 ref.

Descriptors: *Natural resources, *Water quality standards, *Metals, *Mercury, *Toxicity, Cadmium, Lead, Heavy metals, Copper, Organic acids, *Trace elements, *Pollutant identification.
Identifiers: Nuclear magnetic resonance, Mass spectrometry, Polarography.

The determination of trace levels of toxic metals in natural waters is being investigated at the National Bureau of Standards. A study of the chemical, biological, and other mechanisms operative in natural water systems for mobilization and transport of heavy metal focuses on the transformation of inorganic mercury into highly toxic forms. Field samples of sediment and water are being analyzed for total mercury and organic mercury by nuclear magnetic resonance and mass spectrometry. In another similar project, cathode ray polarography has led to the development of improved methods for determining metals and organic substances, such as nitriloacetic acid. A stable isotope dilution procedure was developed using the spark source mass spectrograph for simultaneously determining a dozen trace elements in river water samples. Concentrations in parts per billion were determined for mercury, cadmium, lead, and copper. (Merritt-FIRL)
W74-09512

PITFALLS IN PARAMETER ESTIMATION FOR OXYGEN TRANSFER DATA,
Wisconsin Univ., Madison.
W. C. Boyle, P. M. Berthouex, and T. C. Rooney.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE2, p 391-408, April, 1974. 10 fig, 4 tab, 8 ref.

Descriptors: *Model studies, *Estimates, *Aeration, Analytical techniques, Numerical analysis, Oxygen, Dissolved oxygen.
Identifiers: *Oxygen transfer data.

Some of the pitfalls of methods of parameter estimation application to the analysis of oxygen transfer data are examined. The following must be considered: know the error structure of the data and apply appropriate weighting procedures in the analysis of the data; corroborate the value of the dissolved oxygen saturation concentration employed to estimate the overall oxygen transfer coefficient (K) through experimental data for a given physical arrangement of aeration and basin geometry. Truncation of an aeration test before reaching saturation can produce substantial error in estimates of K unless a precise estimate of the dissolved oxygen concentration (C) can be determined. Truncation of dissolved oxygen data up to 20% will not effect the precision of the estimate of K. The product of KC tends to compensate for erros in K and C and will normally give reasonable estimates of the oxygen transfer rate. Poor estimates of C will tend to produce substantial error in the calculation of oxygen transfer rates. (Merritt-FIRL)
W74-09514

HEALTH EFFECTS OF ENVIRONMENTAL POLLUTANTS,
For primary bibliographic entry see Field 5C.
W74-09547

DETECTION OF TRACE METALS IN WATER,
J. D. Kerber.
Industrial Water Engineering, p 19-21, September-October 1973. 3 fig, 2 tab.

Descriptors: *Trace elements, *Water analysis, *Spectrophotometry, *Analytical techniques, Separation techniques, Water sampling, Costs, Metals, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy.

Atomic absorption, the generally preferred method for the analysis of trace metallic pollutants is reviewed. It is a quantitative rather than qualitative technique for the determination of elements in analytical samples, and in general, the samples must be in solution or suspension. In atomic absorption, the sample is heated to a high temperature to convert the molecules to individual atoms which float freely in the sample area. In this condition, they can absorb ultraviolet or visible radiation. To determine the concentration of an element in the sample, the analyst passes light from a hollow cathode lamp containing that element. A certain portion of the light is absorbed by the flame heating the sample and the spectrophotometer reads out the results. Although atomic absorption is relatively free from interferences, there are detection limits. For certain elements, auxiliary sampling techniques must be employed to concentrate the element of interest and thereby bring its levels within the detection limit or to improve the detection limit capabilities of atomic absorption. The cost of equipment ranges from $4,000 to over $13,000. (Jernigan-Vanderbilt)
W74-09581

CHEMICAL SURVEY OF WATERS ADJACENT TO COLONELS ISLAND, GLYNN COUNTY, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
W. M. Dunstan, and R. R. Stickney.

Georgia University Marine Science Center Technical Report Series No 74-1, March 1974. 12 p, 1 fig, 4 tab, 5 ref.

Descriptors: *Water quality, *Estuaries, *Georgia, Mixing, Dissolved oxygen, Salinity, Water temperature, Water chemistry, Hydrogen ion concentration, Nitrates, Phosphates, Mixing.
Identifiers: *Brunswick River(Ga).

Basic measurements of the water quality of the Brunswick River adjacent to Colonels Island, Georgia were made over a tidal cycle. The reported values for temperature, salinity, dissolved oxygen, pH, ammonia, chlorophyll a, nitrate and phosphate while limited to one season are within the range of values which might be expected for such an estuarine-river system. All the parameters measured indicate that the estuarine area is well mixed. (Knapp-USGS)
W74-09584

A HYBRID AUTOMATIC ANALYSER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
K. B. Pugh, and L. W. Chubb.
Chemosphere; Vol 3, No 3, p 97-101, June 1974. 1 fig, 2 plate, 5 ref.

Descriptors: *Chemical analysis, *Equipment, *Ammonia, *Nitrates, *Nitrites, Nitrogen, Automation, Water analysis, Colorimetry, Sampling, *Pollutant identification.

A three channel automatic analyser was constructed for ammonium, nitrite, and nitrate determinations. The system comprises sampler, proportioning pump, glassware, heating bath, colorimeters, and recorders. The system may also be used to determine phosphates in sea water. (Knapp-USGS)
W74-09622

AN ADAPTED DETERMINATION OF PHOSPHATE IN SEAWATER FOR USE WITH THE HYBRID AUTOMATIC ANALYSER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
K. B. Pugh, and C. F. Gibbs.
Chemosphere, Vol 3, No 3, p 103-105, June 1974. 3 ref.

Descriptors: *Chemical analysis, *Equipment, *Ammonia, *Nitrates, *Nitrites, Nitrogen, Automation, Water analysis, Clorimetry, Sampling, *Pollutant identification.

A three channel automatic analyser was constructed for ammonium, nitrite, and nitrate determinations. The system comprises sampler, proportioning pump, glassware, heating bath, colorimeters, and recorders. The system may also be used to determine phosphates in sea water. (Knapp-USGS)
W74-09623

APPLICATION OF REAL-TIME MASS SPECTROMETRIC TECHNIQUES TO ENVIRONMENTAL ORGANIC GEOCHEMISTRY. II. ORGANIC MATTER IN SAN FRANCISCO BAY AREA WATER,
California Univ., Berkeley. Space Sciences Lab.
B. R. Simoneit, D. H. Smith, G. Eglinton, and A. L. Burlingame.
Archives of Environmental Contamination and Toxicology, Vol 1, No 3, p 193-208, 1973. 5 fig, 1 tab, 24 ref.

Descriptors: *Pollutant identification, *California, Rivers, *Bays, Solvents, Solubility, Sampling, Water sampling, *Organic matter, *Oil wastes, Gas chromatography, Mass spectrometry.
Identifiers: *San Francisco Bay, San Pablo Bay, Carquinez Strait, Sacramento River, San Joaquin River.

The solvent soluble (organic) matter passing through a fine fitted filter was investigated in samples of water taken from the San Francisco and San Pablo bays, the Carquinez Strait, and an estuary in the confluence of the Sacramento and San Joaquin rivers. The petroleum ether extracts (ranging) from 2.5 to 102 microgram/liter) were analyzed using gas chromatography, computer coupled gas chromatography/mass spectrometry, and high resolution mass spectrometry. The organic compounds identified in these extracts are quite diverse and consist mainly of hydrocarbons from various sources. Some phthalate esters occur at various sampling sites. It is concluded that the techniques of gas chromatography/mass spectrometry, and high resolution mass spectrometry are ideally suited to the assessment of some of the potential interactions of pollutants and other organic compounds in the aquatic environment. (Merritt-FIRL)
W74-09742

ERTS-1 VIRGIN ISLANDS EXPERIMENT 589--DETERMINE BOUNDARIES OF ERTS AND AIRCRAFT DATA WITHIN WHICH USEFUL WATER QUALITY INFORMATION CAN BE OBTAINED,
Grumman Ecosystems Corp., Bethpage, N.Y.
W. C. Coulbourn, W. G. Egan, D. A. Olsen, and G. B. Heaslip.
Available from NTIS, Springfield, Va 22151 as N74-1500 Price $14.75 printed copy; $1.45 microfiche. Grumman Ecosystems Corporation Final Contract Report to Goddard Space Flight Center, October 1973. 227 p, 110 fig, 41 tab. NASA Contract NAS 5-21811.

Descriptors: *Remote sensing, *Water quality, *Satellites(Artificial), *Virgin Islands, Water pollution, Turbidity, Data collections.
Identifiers: *ERTS.

The boundaries of ERTS and aircraft data within which useful coastal zone water quality information could be obtained were tested in the Virgin Islands. A secondary objective was to provide an expandable water quality data base. Ground truth data is necessary to properly interpret ERTS-1 MSS Scanner Radiance Values by correlating turbidity with physical, chemical and biological water properties. (Knapp-USGS)
W74-09756

CADMIUM UPTAKE BY WHEAT FROM SEWAGE SLUDGE USED AS A PLANT NUTRIENT SOURCE, A COMPARATIVE STUDY USING FLAMELESS ATOMIC ABSORPTION AND NEUTRON ACTIVATION ANALYSIS,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5C.
W74-09758

MERCURY IN HUMAN HAIR, A STUDY OF THE RESIDENTS OF LOS ALAMOS, NM, AND PASADENA, CALIF., BY COLD VAPOR ATOMIC ABSORPTION SPECROPHOTOMETRY,
Cincinnati Univ., Ohio. Coll. of Medicine.
P. J. Nord, M. P. Kadaba, and J. R. J. Sorenson.
Archives of Environmental Health, Vol 27, No 1, p 40-44, July 1973. 2 fig, 2 tab, 12 ref.

Descriptors: *Mercury, Human physiology, *Analytical techniques, Toxicity, Contaminants, Public health, Testing procedures, Laboratory tests, Spectroscopy, Distribution, *California, *New Mexico, *Pollutant identification.
Identifiers: *Human hair, Atomic absorption spectroscopy.

Rapid digestion and quantitative mercury recovery are obtained when hair is digested in a mixture of nitric acid, sulfuric acid, and potassium permanganate. The studies were done on replicate samples drawn from a large homogeneous air sample used as a standard reference. The method was applied to hair samples from 80 men and 147 women, long-term residents of Los Alamos, NM, and 99 women, long-term residents of Pasadena, Calif. The geometric mean of the mercury concentration found in the hair samples was: Los Alamos, 18.0 micro g/gm (men) and 18.9 micro g/gm (women); Pasadena, 25.0 micro g/gm. Values ranged from 5 micro g/gm to over 100 micro g/gm. The mean values found are higher than previously reported. The results suggest that there may be differences in the environmental exposure of the two populations to mercury. (Jernigan-Vanderbilt)
W74-09759

INTERFERENCES IN THE DETERMINATION OF METALLIC ELEMENTS IN HUMAN HAIR, AN EVALUATION OF ZINC, COPPER, LEAD AND CADMIUM USING ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Cincinnati Univ., Ohio. Coll. of Medicine.
J. R. J. Sorenson, E. G. Melby, P. J. Nord, and H. G. Petering.
Archives of Environmental Health, Vol 27, No 1, p 36-39, July 1973. 3 tab, 11 ref.

Descriptors: *Heavy metals, Laboratory tests, *Analytical techniques, Human physiology, *Zinc, *Copper, *Lead, *Cadmium, Toxicity, Spectroscopy, Testing procedures, Contaminants, Public health, Pollutant identification.
Identifiers: *Human hair, *Atomic absorption spectroscopy.

Hair, a metabolic end product, has been used to indicate health status. The purposes in this study were: (1) to evaluate the hair digest matrix as a source of interferences in the determination of metals using atomic absorption spectrophotometry, and (2) to develop a technique whereby meaningful interlaboratory comparison of analytical data can be made. For hair analysis, interferences due to broad-band nonspecific molecular absorption, chemical ionization, flame emission, flame scatter, light scatter, and matrix matching can be avoided using ordinary methods and commercially available equipment. A technique is presented for the preparation of a standard reference hair sample. This standard reference hair was then used to demonstrate that concentrations of copper, zinc, lead and cadmium in a nitric acid hair digest matrix can be measured with precision and accuracy. (Jernigan-Vanderbilt)
W74-09760

AQUA REGIA FOR QUANTITATIVE RECOVERY OF MERCURIC SULFIDE FROM SEDIMENTS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
L. W. Jacobs, and D. R. Keeney.
Environmental Science and Technology, Vol 8, No 3, p 267-268, March 1974. 1 tab, 6 ref.

Descriptors: *Mercury, *Sediments, *Water pollution sources, *Analytical techniques, Separation techniques, Chemical analysis, Organic compounds, Inorganic compounds, Digestion.
Identifiers: *Mercuric sulfide, *Aqua Regia, Quantitative recovery.

A digestion procedure consisting of a 2:1 concentration of sulfuric:nitric acids plus potassium permanganate and persulfate oxidation proved to be inadequate for quantitative recovery of HgS, a Hg compound that may be present in reduced materials such as river and lake sediments and waste sludges. Since HgS or Hg(II) associated with metal sulfide phases may be a significant fraction of the total Hg in these substances, incomplete dissolution of these Hg(II) sulfide phases during sample digestion will cause total Hg concentrations to be underestimated. An aqua regia digestion procedure which quantitatively recovers HgS

from sediments is described, and is recommended for total Hg analyses of sediments. Potassium permanganate and persulfate must be included with aqua regia to obtain complete recovery of five other Hg compounds implicated in Hg transformations and pollution in the environment. Nonaqua regia procedures being used to analyze sediments or sludges for total Hg should be tested for quantitative recovery of HgS. (Jernigan-Vanderbilt)
W74-09763

A NEW VANADYL (IV) THIOCYANATE METHOD FOR THE SPECTROPHOTOMETRIC DETERMINATION OF VANADIUM (IV),
Andhra Univ., Waltair (India). Dept. of Chemistry.
U. Muralikrishna, and K. V. Bapanaiah.
Current Science, Vol 42, No 13, p 460-461, July 5, 1973. 3 ref.

Descriptors: *Spectrophotometry, *Analytical techniques, Chemical analysis, Water quality, Heavy metals, Color reactions, *Trace elements, *Pollutant identification.
Identifiers: *Vanadium.

The extraction behavior of vanadyl thiocyanate complex with 8:3 n-butanol and ethyl acetate was studied. This method has the advantage of (1) 2-20 mg of vanadium can be estimated rapidly, and (2) tolerance to interference by common anions and larger reagent concentrations (50 to 100 fold). The extraction is quantitative and rapid (equilibium time is less than 30 sec) within the pH range of 0.5 to 2.5. Maximum absorption is at 730 nm wavelength. Interference with the method is caused by Fe(III), Mo(VI), Ni(II) and Cu(II). (Jernigan-Vanderbilt)
W74-09765

HEAVY ELEMENTS IN SURFACE MATERIALS: DETERMINATION BY ALPHA PARTICLE SCATTERING,
Chicago Univ., Ill. Enrico Fermi Inst.
T. E. Economou, W. A. Anderson, E. M. Blume, and A. L. Turkevich.
Science, Vol 181, p 156-158, July 1973. 2 fig, 1 tab, 6 ref.

Descriptors: *Heavy metals, *Lead, *Paints, *Toxicity, *Analytical techniques, Instrumentation, *Pollutant identification.
Identifiers: Surface materials, Alpha particle scattering.

The backscattering of alpha particles from a radioactive source can be used to determine the amounts of heavy elements such as lead in surface materials. A light, portable instrument has been constructed that can be used as a survey meter for painted surfaces. It was intended for use as a survey meter for lead detection by a semiskilled person. It can detect lead content of less than 0.3% in a surface paint in a measurement lasting a few minutes. One limiting characteristic of this instrument is that it provides information only about the top layer of the surface or just a few micrometers deep even if many layers of paint have been applied. The main components of the instrument are: (1) a source of alpha radioactivity that emits relatively monochromatic alpha particles and a negligible amount of harmful penetrating radiation such as gamma or x-rays; (2) a detector of the silicon surface-barrier type to register the number of backscattered alpha particles and their energy; (3) electronics consisting of a charge-sensitive preamplifier and amplifier for the signal from the detector, and a discriminator eliminating the signals from the alpha particles with low energies; and (4) a read-out system and timer. Values obtained compare favorably with those from conventional analysis. (Jernigan-Vanderbilt)
W74-09770

ISOLATION OF (BETA SUB 2)-MICROGLOBULIN FROM THE URINE OF PATIENTS WITH ITAI-ITAI (OUCH-OUCH) DISEASE,
National Inst. of Industrial Health, Kawasaki (Japan). Dept. of Occupational Diseases.
M. Ohsawa, and M. Kimura.
Experientia, Vol 29, No 5, p 556-558, 1973. 3 fig, 1 tab, 16 ref.

Descriptors: *Cadmium, *Proteins, *Human pathology, *Electrophoresis, *Urine, Laboratory tests, Analytical techniques, Testing procedures, Industrial wastes, Heavy metals, Pollutant identification, *Isolation.
Identifiers: *Proteinuria, Microglobulin.

This study shows that (Beta sub 2)-microglobulin can be isolated from the urine of patients with Itai-itai disease and that it is one of the main components in the proteinuria associated with this disease. In the experiment, 24 hour urine specimens were collected from female patients with Itai-itai disease. Urinary protein was determined by the biuret method according to Piscator's procedure. Urinary protein varied between 0.7 to 1.4 g per 24 h. Great quantities of Beta sub 2-microglobulin is excreted in the urine of patients with Itai-itai disease. Two distinguishable retinolbinding proteins giving the same mobility on disc electrophoresis as that of band 3, were also isolated preliminarily from the same urine. It was concluded from the findings on urinary low molecular weight proteins that proteinurea of Itai-itai disease is similar to the tubular one of chronic cadmium poisoning, but further work on urinary levels
this disease is required to explain the significance of this similarity. (Jernigan-Vanderbilt)
W74-09771

SIGNIFICANCE OF LEAD ISOTOPE COMPOSITION IN BLOOD,
Texas Univ., Dallas, Inst. for Geological Sciences.
W. I. Manton.
Nature, Vol 244, No 5412, p 165-167, July 1973. 5 fig, 1 tab, 9 ref.

Descriptors: *Lead, *Isotope studies, *Human pathology, Stable isotopes, Analytical techniques, Testing procedures, Mass spectrometry, Air pollution, *Texas, Distribution, *Pollutant identification.
Identifiers: *Blood, *Dallas(Tex).

Since blood sampling is the easiest means of conducting a large scale investigation of lead in the human body, the feasibility of such a program is studied. Measurements were made of the ratios of lead isotopes in the blood of residents, in particulate airborne lead and in emissions from two smelters in residential districts in southern Dallas. Tests indicated that lead in the blood ontinuously mixes with a large reservoir of lead elsewhere in the body, presumably the skeleton. Since it can be demonstrated that long response times are consistent with available data regarding the daily uptake and body burden of lead, it appears that the same number of atoms of lead as enter the blood each day, are removed in the urine, maintaining the total number of atoms of lead in the body constant. Isotope tracer studies to measure the uptake of lead from pollutants are best attempted on children, because, as a child grows and his bones calcify, lead moves from his blood into his skeleton. The isotope ratios of lead in his blood will therefore be fairly representive of the lead to which he has been exposed, irrespective of any exchange of isotopes with the skeleton. (Jernigan-Vanderbilt)
W74-09772

MERCURY IN WATER: AN EVALUATION OF LABORATORIES AND METHODOLOGY,
California State Dept. of Public Health, Berkeley. Sanitation and Radiation Lab.
A. E. Greenberg, J. Thomas, and B. R. Tamplin.
Journal of the American Water Works Association, Vol 65, No 8, p 552-554, August 1973. 1 tab, 8 ref.

Descriptors: *Analytical techniques, *Spectroscopy, *Mercury, *Public health, Laboratory tests, Water quality, California, Colorimetry, Potable water, Water analysis, Pollutant identification.
Identifiers: *Inter-laboratory comparisons, Atomic absorption spectroscopy, Accuracy.

Each of seven labs received a set of fourteen randomly coded water samples with specific amounts of mercury. These samples consisted of four natural waters from community samples, one doubly-distilled blank, three samples containing 4 micrograms/l, and two samples containing 6 micrograms/l. Three labs used the flameless atomic absorption technique (one also used crystal violet colorimetric technique), two others used colorimetric technique (crystal violet, and dithizone), one used a wide-band Hg analyzer and the last used a dithizone field kit. Results from the lab which used the field-test-kit dithizone method were unacceptably high, bore no relationships to the results of the other laboratories and were therefore excluded from further consideration. Resports of the other labs were relatively consistent. The best results, in terms of accuracy and precision, were obtained with flameless atomic-absorption. The results attained with the crystal violet procedure were acceptable but less precise and accurate than atomic-absorption, and the dithizone method was still less satisfactory. (Jernigan-Vanderbilt)
W74-09774

of these proteins in

QUANTITATIVE SEPARATION OF MAGNESIUM AND PALLADIUM FROM NUMEROUS METAL IONS ON TITANIUM TUNGSTATE PAPERS BY ELECTROCHROMATOGRAPHY,
Aligarh Muslim Univ. (India). Dept. of Chemistry.
M. Qureshi, K. G. Varshney, and F. Khan.
Separation Science, Vol 6, No 4, p 559-572, August 1971. 8 tab, 12 ref.

Descriptors: *Chromatography, *Separation techniques, *Electrolytes, *Cations, Metals, *Electrochemistry, Analytical techniques, Spectrophotometry, Ions, Ion exchange, Chemical reactions, Laboratory tests, *Magnesium, *Pollutant identification.
Identifiers: *Palladium.

Electrochromatography was performed on 46 metal ions in 15 electrolytes on papers impregnated with titanium tungstate by applying different electrical potentials and allowing different time intervals for migration. On the basis of the differential mobility of the cations, which depend on the nature of the complexes formed with the background electrolytes and the ion exchange properties of titanium tungstate, a large number of binary and ternary separations were achieved. The separations of one metal ion from numerous metal ions were also accomplished. In removal of magnesium from titanium tungstate papers 5% NCl proved to be the ideal eluting solvent. Elution of palladium was possible from wet paper with 40 ml of 10% HCl. Cleaner and faster separation of metal ions tested depended on the ion exchange paper and on the background electrolyte. (Jerome-Vanderbilt)
W74-09782

STUDIES OF SOLVENT EXTRACTION BEHAVIOR OF SOME DIVALENT METALS WITH LIQUID ION-EXCHANGER,
Palli Siksha Sadana, Sriniketan (India). Dept. of Chemistry.
A. K. De, and U. S. Ray.
Separation Science, Vol 6, No 3, p 443-450, June 1971. 2 fig, 2 tab, 3 ref.

Descriptors: *Solvent extractions, *Heavy metals, *Ions, *Ion exchange, Analytical techniques, Separation techniques, Testing procedures, Laboratory tests, Acids, Measurement, *Pollutant identification.
Identifiers: Divalent metals.

A systematic study of the comparative extraction behavior of aqueous solutions of some divalent metals was carried out with a high molecular weight carboxylic acid, SRS-100, with benzene used as a diluent. The study includes the extraction behavior as a function of pH, effect of diluent, metal ion concentration, solvent concentration, and interference of the associated elements. In almost all cases nearly quantitative extraction was achieved. The proposed method is simple, rapid, and applicable both at micro and macro levels. The method is applicable to extraction of metal ions in the presence of other commonly interfering ions at milligram levels. Metals examined include Fe, Zn, Cd, Hg, Pb, Pd, Mg, Ca, Sr, and Ba. (Jerome-Vanderbilt)
W74-09783

ZINC AND CADMIUM IN NORMAL HUMAN EMBRYOS AND FETUSES, ANALYSES BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Inst. of Rehabilitation Medicine. Univ. Medical Center, N.Y.
For primary bibliographic entry see Field 5C.
W74-09785

THE FLUOROMETRIC DETERMINATION OF SELENIUM: A LITERATURE REVIEW.
Fluorometry Reviews, G. K. Turner Associates, Palo Alto, California, September, 1972. 4 p, 25 ref.

Descriptors: *Fluorometry, *Trace elements, *Testing procedures, Toxicity, Laboratory tests, *Reviews, Organic matter.
Identifiers: *Selenium.

Since selenium is one of the essential trace elements, it is important to be able to measure very low concentrations of selenium in animal tissues, in soils, and especially in feeds - to determine that the necessary amount is present without reaching toxic levels. Large amounts of selenium can be assayed by gravimetric determinations, titrations, and colorimetric methods. In 1960 Cousins reported a fluorometric method for measuring selenium yielding increased sensitivity. A typical fluorometric procedure is presented in detail. Selenium in the form of selenite reacts with aromatic ortho-diamines to form piazselenols which fluoresce in certain organic solvents. With biological specimens, the sample must first be ashed under strong oxidizing conditions. The inorganic selenium is isolated and converted to the IV oxidation state. It is then reacted with the ortho-diamine and the piazselenol is extracted into a suitable organic solvent for measurement. Modifications depending on the type of sample which are discussed include digestion methods (wet or combustion with oxygen), removal of interfering substances either by separation of selenium or masking the interference, and choice of reagent for the production of fluorescence. Filters for use in the fluorometer for measurement are mentioned. (Jernigan-Vanderbilt)
W74-09792

5B. Sources Of Pollution

BIOLOGICAL DEGRADATION OF HYDROCARBONS IN WATER,
Rhode Island Univ., Kingston. Dept. of Microbiology.
C. W. Houston.
Available from the National Technical Information Service as PB-233 438, $3.25 in paper copy, $1.45 in microfiche. Completion Report, (1974). 31 p, 14 fig, 2 tab, 6 ref. OWRR B-033-RI(1). 14-31-0001-3640.

Descriptors: *Organic compounds, Pseudomonas, *Growth rates, *Mass transfer, *Biodegradation, Pollution, Kinetics, Mathematical models.
Identifiers: *Heptane, *Pseudomonas aeruginoss.

The growth of Pseudomonas aeruginoss on n-heptane was found to be exponential only at low cell concentrations (1 gm/l). The change from exponential to linear growth rate occurs when dissolved oxygen is well above the critical value. The data fit the mathematical model for homogeneous kinetics developed by Dunn in 1958. They suggest that heptane is used in dissolved form rather than by direct contact between microorganism and hydrocarbon droplet. A decrease in interfacial tension during growth is attributed to the production of a surface tension depressant by the organism. Increased solubility of the hydrocarbon as a result of its production may account for the high growth rate observed on this substrate of low solubility.
W74-09254

SEASONAL VARIATIONS IN THE TRITIUM ACTIVITY OF RUN-OFF FROM AN ALPINE GLACIER (KESSELWANDFERNER, OETZTAL ALPS, AUSTRIA),
Innsbruck Univ. (Austria). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W74-09341

ECOLOGICAL INVESTIGATION OF EUBACTERIA AND ACTINOMYCETES IN AQUATIC AND TERRESTRIAL BIOTOPES OF CROATIA (IN SERBO-CROATIAN),
Institut za Botaniku, Zagreb (Yugoslavia).
Z. Pavletic, and B. Stilinovic.
Acta Biol Iugosl Ser B Mikrobiol, Vol 8, No 1, p 77-84, 1971, English summary.
Identifiers: *Actinomycetes, Adriatic coast, Bacteria, *Biotopes, Ecological studies, *Eubacteria, Fungi, Rivers, Sea, Soils, Springs, Streptomycesfradiae, *Yugoslavia(Croatia), *Heterotrophic bacteria.

A review of research on the ecology of bacteria in Croatia is given. Rivers, hot springs, the sea and soils were investigated. The rivers of the continental Korana (including Plitivice lakes), Mreznica and Sava regions and the entire course of the river Mirna in Istria were examined for total numbers of heterotrophic bacteria and most probable number of coliforms. In the Tuhelj hot springs, actinomycetes from thermal mud had very high antimicrobial activity due to a race of Actinomyces (Streptomyces) fradiae. The bacteria in seawater determined at about 20 points in the bay of Rijeka, between the cities of Selce and Plomin were examined and the occurrence of a number of heterotrophic bacteria and coliforms was noted both along the coast and in open sea in winter. Detailed research on actinomycetes in continental and littoral soils of Medjimurje in N. Croatia, Medvednica Mountain, the region around Zagreb, the eastern region of Slavonia, the southern region of Gorski Kotar, Istria, the Croatian Adriatic coast, the littoral region of Dalmatia and the islands of Krk, Rab, Pag, Dugi, Kornati, Prvic, Kolocep and Lopud was conducted. Actinomycetes in specific types of soils and their relationship to other bacteria and fungi, and antagonistic races of actinomycetes and their relationship to soil type and vegetation were studied.--Copyright 1974, Biological Abstracts, Inc.
W74-09351

EFFECTS OF SALINITY AND SUSPENDED SEDIMENT ON TURBULENT DIFFUSION OF POLLUTANT IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
C. Y. Kuo.
Available from the National Technical Information Service as PB-233 365, $3.25 in paper copy, $1.45 in microfiche. Completion Report UPRICO-WRRI-PR-73-74, Puerto Rico Water Resources Research Institute, Mayaguez, December 1973. 29 p, 13 fig, 7 tab, 3 ref. OWRR A-034-PR(1).

Descriptors: Streams, Estuaries, Bays, Pollutants, Municipal wastes, Industrial wastes, *Sediments, Suspension, *Salinity, *Turbulence, *Diffusion, Water pollution control, *Puerto Rico, Diffusivity, *Path of pollutants, Sugarcane, Turbulent flow, Dispersion.
Identifiers: Sugarcane wastes.

Due to the spatial variation of salinity in estuaries and coastal waters, a study was made in the laboratory of the molecular and the turbulent diffusion process in fluid media with various salinity. Dye diffusions were performed in salt water of known concentrations to simulate the dispersion of pollutant in tidal waters. Both the turbulent and the molecular diffusion coefficient increase as the salinity increases. The variation of the turbulent diffusion coefficient is approximately linear with respect to the salinity. However, the molecular diffusion coefficient tends to charge non-linearly with the salinity. The turbulent diffusion rate is rather uniform with comparison to the molecular diffusion rate.
W74-09362

BIOLOGY, DISTRIBUTION, IMPORTANCE AND CONTROL OF DEER FLIES AND HORSE FLIES (DIPTERA:TABANIDE) IN WATER-ORIENTED RECREATIONAL AREAS,
Clemson Univ., S.C. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5G.
W74-09363

HYDROGEOLOGY OF THE FORMATION AND NEUTRALIZATION OF ACID WATERS DRAINING FROM UNDERGROUND COAL MINES OF WESTERN MARYLAND,
Geological Survey, Parkville, Md.
E. F. Hollyday, and S. W. McKenzie.
Maryland Geological Survey Report of Investigations No 20, 1973. 50 p, 16 fig, 8 tab, 71 ref.

Descriptors: *Acid mine water, *Hydrogeology, *Neutralization, *Maryland, Coal mines, Mine acids, Path of pollutants, Water quality, Water chemistry, Water pollution control, *Mine drainage.

The flows from 18 underground mines for which mine maps are available in the bituminous coal basins of western Maryland were measured, and water samples were collected for determination of 27 major dissolved constituents and chemical properties and 28 minor elements. Natural neutralization is taking place in the underground environment and the most nearly neutralized acid mine drainage is associated with flow from an upper mine to a lower mine through the intervening rock strata. (Knapp-USGS)
W74-09369

GEOLOGIC ASPECTS OF LANDFILL REFUSE DISPOSAL,
Louisville Univ., Kentucky. Dept. of Civil Engineering.
D. J. Hagerty, and J. L. Pavoni.
Engineering Geology, Vol 7, No 3, p 219-229, December 1973. 3 tab, 28 ref.

Descriptors: *Landfills, *Garbage dumps, *Leaching, Water pollution effects, *Path of pollutants, Water pollution control, Hydrogeology, Aquifer characteristics, Water quality, Water chemistry.

The decomposition of solid waste materials in sanitary landfills produces liquids and gases which are deleterious to human beings, animals, plants and inorganic geologic materials. Leachate characteristics and the effect of leachate on groundwater quality and carbonate strata are discussed. A system for site evaluation for purposes of sanitary landfill is presented. The characteristics of the soil and rock at a site are included in the evaluation system through assessment of their infiltration potential, permeability, filtering capability and ab-

sorption potential. The characteristics of the groundwater at a site are taken into consideration through assessment of the substrate potential, buffering capacity and distributive potential for contaminants. Formulae are given which allow determination of evaluation parameters, and an example of the application of the rating system is presented. Use of the site-evaluation system will improve the quality of site selection and will reduce contamination and pollution problems created by construction of refuse landfills at unsuitable locations. (Knapp-USGS)
W74-09375

THE COOPER RIVER ENVIRONMENTAL STUDY.
For primary bibliographic entry see Field 2L.
W74-09379

WATER QUALITY PORTION OF THE COOPER RIVER ENVIRONMENTAL STUDY.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
In: Cooper River Environmental Study. South Carolina Water Resources State Water Plan Report, No 117, p 64-103L, April 1974. 8 fig, 12 tab, 6 ref.

Descriptors: *Estuaries, *South Carolina, *Saline water intrusion, *Flow control, Path of pollutants, Stratified flow, Streamflow, Discharge(Water).
Identifiers: *Cooper River(SC), *Charleston Harbor(SC).

A multi-agency study of the Cooper River, South Carolina includes physical, chemical, and biological investigations both before and during a controlled, reduced flow period. By comparing the October study data (representing a high flow condition) to the November study data (representing a controlled reduced flow condition), some of the effects of proposed rediversion can be demonstrated. Daily flow to the Cooper River from Lake Moultrie averaged 20,550 cfs during the October study and 3,000 cfs during the November study period. Water temperature averaged 21.5 deg C during the October study and 17.9 deg C during the November study. Dissolved oxygen concentrations ranged from 3.4 mg/liter at mile 16.5 to 8.4 mg/liter at mile 44.2 during October and 5.0 mg/liter at mile 44.2 during the November study. Average dissolved oxygen concentrations were not significantly different between the October and November study periods. During October, percent saturation values for dissolved oxygen ranged from 70.7 to 88.1 and 71.8 to 92.6 percent for high and low slack tide, respectively (surface and bottom samples averaged). Percent saturation values for dissolved oxygen at reduced river flow (November) ranged from 69.7 to 89.7 percent and 71.6 to 90.8 percent for high and low slack tide, respectively. (See also W74-09379) (Knapp-USGS)
W74-09385

SURFACE WATER HYDRAULICS.
For primary bibliographic entry see Field 2L.
W74-09387

THE EFFECT OF PROPOSED DEEPENING OF THE JOHN F. BALDWIN AND STOCKTON SHIP CHANNELS ON SALT-WATER INTRUSION, SUISUN BAY AND SACRAMENTO-SAN JOAQUIN DELTA AREAS, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. P. Akers.
Water-Resources Investigations 56-73, March 1974. 10 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Saline water intrusion, *Dredging, *California, *Surface-groundwater relationships, Channel improvement, Bays, Navigation.
Identifiers: *Suisun Bay(Calif), Sacramento-San Joaquin Delta(Calif).

The natural channel adjacent to the reach of the John F. Baldwin and Stockton ship channels between the Benicia-Martinez bridge and False River, California has been deeper than the authorized 36-ft depth. A considerable part of the reach has been deeper than the 47-ft depth authorized for the ship channel in Suisun Bay. Thus, most of the permeable strata that immediately underlie the alinement of the proposed improved channel probably already are saturated with saltwater and the proposed channel deepening will not change their present water-quality regimen. (Knapp-USGS)
W74-09408

SURVEY OF ENVIRONMENTAL RADIOACTIVITY, (JANUARY 1973-DECEMBER 1973).
Minnesota Dept. of Health, Minneapolis.
For primary bibliographic entry see Field 5A.
W74-09431

PHOSPHORUS STUDIES IN LOWER GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Madison. Dept. of Water Chemistry.
For primary bibliographic entry see Field 5C.
W74-09435

KINETICS OF SUBSTRATE ASSIMILATION AND PRODUCT FORMATION IN ANAEROBIC DIGESTION,
Institute of Gas Technology, Chicago, Ill. Div. of Bioengineering Research.
S. Ghosh, and F. G. Pohland.
Journal Water Pollution Control Federation, Vol 46, No 4, p 748-759, April 1974. 10 fig, 2 tab, 16 ref.

Descriptors: *Anaerobic digestion, *Kinetics, *Biodegradation, *Mathematical models, *Waste water treatment, *Model studies, Microorganisms, Anaerobic bacteria, Digestion, Wastes, Methane, Acids, Bacteria, Chemical reactions, Sludge digestion, Organic loading, Carbohydrates, Organic compounds, Gases, Fermentation.
Identifiers: Acetic acid, Volatile acids, Butyric acid, Propionic acid, Glucose.

Several kinetic process models are capable of describing the concentrations and production velocities of the various acidic products and gases from an anaerobic digester. Analytical techniques for determining the appropriate kinetic constants of such mathematical models are presented. A number of growth kinetic constants applicable to dominant cultures of acid and methane formers were determined from experimental data. Comparison of the generation times of 4.8 and 0.56 hr for the methane and acid formers, respectively, confirmed the common assumption that methane formation was the rate-limiting step in anaerobic digestion of soluble wastes. Acid fermentation of glucose substrate showed that the yield of acetic acid from glucose was the highest, followed by propionic and butyric acids. (Witt-IPC)
W74-09440

AEROBIC BIODEGRADATION OF CARBOXYMETHYLCELLULOSE,
Hercules Research Center, Wilmington, Del.
M. G. Wirick.
Journal Water Pollution Control Federation, Vol 46, No 3, p 512-521, March 1974. 2 fig, 6 tab, 21 ref.

Descriptors: *Chemical wastes, *Cellulose, *Biodegradation, Aerobic conditions, Organic compounds, *Industrial wastes, Degradation, Ethers, Analytical techniques, Environmental effects, Bacteria, Carbohydrates, Chemical industry, Pulp and paper industry, Additives, Colloids.
Identifiers: *Carboxymethylcellulose, Cellulose ethers, Cellulose derivatives, Thickeners(Viscosity regulators).

Carboxymethylcellulose (CMC) is a versatile hydrophilic colloid possessing considerable thickening power. Its annual U.S. production of approximately 65 million pounds is used in many fields, including adhesives, coatings, cosmetics, detergents, foods, paper, petroleum, pharmaceuticals, and textiles. Because it is completely water-soluble in nearly all of its applications, it eventually finds its way into waste streams, and ultimately into surface water. Although it is nontoxic and is permitted in potable water in concentrations up to 1 mg/liter, predictions concerning its long-range effect on the environment require knowledge of its biodegradability. Thus, two purified CMC samples, CMC-4 and CMC-7 (degrees of substitution 0.41 and 0.71, resp.) were exposed to the action of waste water bacteria in a static air-saturated culture medium. After a week, residual substrate concentrations were determined by two analytical procedures, one specific for the substituent groups and the other sensitive to the carbohydrate portion of molecular chains. Adaptive transfers were then made to fresh solutions, and the process repeated until the percentage degradation stabilized. The rate of biochemical oxidation of CMC-4 maximized at about 80% in 1 week, whereas acclimation of CMC-7 was not complete until the end of the 16th week, when a biodegradation rate of about 60%/week was reached. Microbial attack was more rapid for unsubstituted than for substituted anhydroglucose units. (Witt-IPC)
W74-09442

ON SPENT OF LIQUOR SEMICHEMICAL PULPING. PART III. TOXICITY CHARACTERISTICS OF SCP SPENT LIQUOR AND REDUCTION OF THE TOXICITY (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood chemistry Lab.
For primary bibliographic entry see Field 5C.
W74-09454

A BENTHOS SURVEY (1972) IN THE NORTH SASKATCHEWAN RIVER IN THE VICINITY OF THE PRINCE ALBERT PULP COMPANY, PRINCE ALBERT, SASKATCHEWAN,
Department of the Environment, Winnipeg (Manitoba). Fisheries and Marine Service.
For primary bibliographic entry see Field 5C.
W74-09459

BENTHOS STUDIES (1971 AND 1972) ON THE WINNIPEG RIVER IN THE VICINITY OF THE ABITIBI MANITOBA PAPER COMPANY, PINE FALLS, MANITOBA,
Department of the Environment, Winnipeg (Manitoba). Fisheries and Marine Service.
For primary bibliographic entry see Field 5C.
W74-09460

BIOLOGICAL MONITORING OF THE FRASER RIVER NEAR PRINCE GEORGE, B.C.,
Beak (T.W.) Consultants Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5C.
W74-09463

WASTE WATER LOADS AND THEIR POSSIBLE REDUCTIONS IN THE FINNISH FOREST INDUSTRY (SUOMEN METSAETEOLLISUUDEN JAETIEVESIKUORMITUS JA SEN KEHITYSNAEKMAT),
Finnish National Water Board, Helsinki.
H. Nilsen.
Paperi ja Puu (Papper och Tra), Vol 55, No 11, p 845-848, 851-852, Nov, 1973. 12 tab.

Descriptors: *Water consumption, *Pulp and paper industry, *Pulp wastes, *Water pollution sources, Europe, *Organic loading, Suspended solids, Biochemical oxygen demand, Discharge(Water), Waste water(Pollution).

Identifiers: *Finland, Forest products industries, Pulp mills, Paper mills, Board(Paperboard), Mills, Fiberboard(Building board) mills, Kraft mills.

In 1972 the Finnish forest products industries produced 6,283,000 t of pulp., 4,695,000 t of paper and paperboard, and 260,000 t of fiber insulation boards. Locations of various mills are discussed in relation to their water consumptions and the characteristics of discharged polluted waste waters. Pollution loads caused by different manufacturing processes are compared. The total waste water load discharged in 1972 was 1328 t of BOD and 822 t of suspended solids per 24 hr. Depending on the process and products, these figures varied from 10 to 169 kg of BOD and 16 to 131 kg of suspended solids per ton of product, while specific water consumptions varied from 45 to 579 cu m per ton. Compared to overall Eurpean industry figures, on the average, Finland used more water, lost more solids in pulp production, and discharged greater BOD loads in kraft pulp manufacture. Current methods for reducing effluent loadings are reviewed. The National Water Board of Finland has set of 1980 taget for 50% BOD reduction and 80% solids load reduction, compared to 1970 data. (Brown-IPC)
W74-09465

PATHOGENIC ORGANISMS IN THE MURDERKILL RIVER ESTUARY,
Delaware Univ., Newark. Dept. of Biological Sciences.
E. De Michele.
Journal Water Pollution Control Federation, Vol 46, No 4, p 772-776, April, 1974. 4 fig, 1 tab, 6 ref.

Descriptors: *Pathogenic bacteria, *Aquatic microorganisms, *Waste water treatment, Rivers, *Water pollution, *Delaware, Coliforms, Streptococcus, Water pollution sources, Microorganisms, Water quality, Wastes, Animal wastes, Bacteria, Aquatic microbiology, Discharge(Water), Flow rates, Farm wastes, Freshwater, Water types, Treatment facilities.
Identifiers: *Murderkill River estuary(Del), Kent County(Del).

The Murderkill River is a partial tidal body of water located in Kent County, Delaware, with summer monthly mean freshwater discharges ranging from 17 to 29 cu ft/sec (28.9 to 49.3 cu m/min) at a point coincident with the effluent discharge from the Kent County Regional Wastewater Treatment Plant. Indicator bacterial concentrations were determined over 6 summers to characterize river conditions before startup of the 10 million gal/day (37,850 cu m/day) plant. Of all fecal coliform (FC) concentrations, 45% were greater than 200/100 ml, while 90% of all fecal streptococcus (FS) values exceeded 200/100 ml. The FC:FS ratio always was less than 4.0, with 90% of all values less than 0.7, indicating that the principal sources of pollution probably are animal wastes. (Witt-IPC)
W74-09466

CHLORIDE AND LEAD IN URBAN SNOW,
Department of the Environment, Ottawa (Ontario). Water Quality Div.
B. G. Oliver, J. B. Milne, and N. LaBarre.
Journal Water Pollution Control Federation, Vol 46, No 4, p 766-771, April, 1974. 5 tab, 24 ref.

Descriptors: *Sodium chloride, *Chlorides, *Lead, *Snow, *Urban runoff, Rivers, *Water pollution sources, Water quality, Water pollution, Snowmelt, Gasoline, Water pollution sources, Pollutants, Sodium chloride, Salts, *Canada, Runoff, Deicers, Snow removal.
Identifiers: Leaded gasoline, Ottawa(Ontario).

The chloride and lead concentrations of snow and runoff in Ottawa were determined in order to assess whether snow melting and snow disposal practices were adversely affecting the water of local rivers. The use of sodium chloride for road deicing was shown to increase chloride levels substantially in area rivers. A portion of the lead associated with the burning of leaded gasolines could be traced in the rivers. A considerable reduction of lead input to the rivers could be accomplished by maintaining snow disposal sites away from watercourses and flood plains. (Witt-IPC)
W74-09468

STUDY OF THE DIFFUSION OF THE DEEP SEA DISPOSAL OF RESIDUAL WATER,
M. Aubert, J. Aubert, and J. P. Breittmayer.
Rev Int Oceanogr Med. 29. p 31-52, 1973. Illus. (English summary).
Identifiers: *Bacteria, *Diffusion, *France(Nice), Residual water, Sea water, Waste waters, *Outfalls, *Waste disposal, Path of pollutants.

The basic formula established by Aubert and Desirotte was verified by the construction of outlets. This formula was pessimistic but valid for the evaluation of the bacterial upper limit. The bacterial decrease may be calculated in the case of the outlet of Nice (France) which discharges 2 to 3 cube m/sec. The outlets showed the importance of the thermocline in wastewater dynamics.--Copyright 1974, Biological Abstracts, Inc.
W74-09472

PLATING POLLUTION: THE LATEST FROM EPA, PART 1,
Products Finishing, Vol 38, No 7, p 141-144, April, 1974. 1 tab.

Descriptors: *Standards, Water pollution sources, *Water utilization, *Industrial water, *Waste water treatment, Pollution abatement.
Identifiers: *Electroplating industry.

The stringent limitations proposed by the Environmental Protection Agency on the electroplating industry were discussed at an American Electroplaters' Society seminar. The proposals made by the EPA require that a plater discharge no more than a stated weight of any contaminant for each unit of surface area he plates. The platers must limit concentrations of contaminants in the rinse water to 1.0 mg/liter or less, depending upon the constituent (except for suspended solids). Few, if any, of the pollution control authorities in the electroplating industry believe that the combination of low water usage and low concentrations can be achieved by production plants. The basis for the proposed regulations is a Battelle Memorial Institute study which estimated that a water use of 80 liter/sq m could generally be attained. (Merritt - FIRL)
W74-09491

ENVIRONMENTAL HAZARDS OF NUCLEAR WASTES,
P.P. Micklin.
Science and Public Affairs, Vol 30, No 4, p 36-42, April, 1974. 1 fig, 29 ref.

Descriptors: *Management, *Nuclear wastes, *Radioactive waste disposal, Radioactive wastes, Waste storage, Liquid wastes, Storage tanks, Underground storage, Dead storage, Geological formations.

The management and storage of nuclear wastes are discussed. Krypton-85, cesium-137, and strontium-90 present the greatest management problems because of their long physical half-lives. Because of their highly radioactive content, reactor wastes must be isolated from the biosphere for centuries or longer. The greatest quantity of high level wastes, approximately 85 million gallons, is contained at three federal repositories. Although not presently posing a serious storage problem, these high level radioactive wastes are expected to reach 93 million gallons by the year 2000. Commercial wastes are a more serious problem because they can attain heat and radioactivity levels six times greater per unit of volume. Tank storage has been satisfactory so far, but salt formations are preferred for permanent disposal of commercial high level radioactive wastes since they are dry and impervious to water. Other possible modes of earth disposal include burial deep within other geologic formations, on the seabed and within continental ice sheets. (Merritt - FIRL)
W74-09502

COMPARING EFFLUENT RELEASES FROM NUCLEAR AND FOSSILFUELED POWER PLANTS,
Brookhaven National Lab., Upton, N.Y. Health Physics and Safety Div.
A. P. Hull.
Nuclear News, Vol 17, No 5, p 51-55, April, 1974. 12 fig, 2 tab, 21 ref.

Descriptors: *Air pollution, *Nuclear powerplants, *Fossil fuels, Gases, Halogens, Particulates, Corrosion, Radioactive wastes, *Water pollution sources, Water pollution effects.
Identifiers: Liquid fission.

Airborne effluent releases from nuclear power plants are compared to those from fossil fueled power plants. Yearly overall average amounts of gaseous, halogen and particulate, liquid fission and corrosion products, and tritium activity from 1967 to 1972 have been calculated and are tabulated. Data for similar comparisons of conventional radioactivity and pollutants in liquid effluents are not available. However, studies to date in the vicinity of several nuclear power reactors suggest that their radioactive liquid effluents have been dosimetrically insignificant. Comparable studies of the degree of pollution of streams and groundwater by releases peculiar to fossil fueled plants have not appeared in the literature, so it also appears to be minimal. (Merritt - FIRL)
W74-09503

CORRELATION BETWEEN TURBIDITY AND IRON CONTENT OF THE FILTER EFFLUENT OF WELL ORIGIN,
Yugoslav Dept. of Water Treatment Plant Automation, Belgrade.
A. Filip, and B. Vuskovic.
Journal American Water Works Association, Vol 66, No 3, p 166-168, March, 1974. 5 fig, 2 ref.

Descriptors: *Wells, Groundwater, *Turbidity, Water quality, *Iron, *Iron compounds, *Filters.
Identifiers: Filter effluent, *Turbidimeter, Iron trace analyzer.

The investigation had a twofold purpose: First, to check the already known dependence of filter-effluent quality on filter age as well as the steady-state operation, and second, to define the correlation between turbidity and iron content in the filter effluent. The experiments were performed with iron trace analyzer and low-range turbidimeter, and turbidity and iron content were shown to be highly correlated. Additionally, the experiments have proven that the turbidimeter and iron analyzer can be used for continuous monitoring of the filter effluent of well-origin water, except when there are iron compounds present or when there is any solid phase other than insoluble iron compounds suspended in the water. Comparing these two types of instruments reveals that turbidimeters are preferable because they have shorter time constants, are less expensive, and are easier to operate and maintain. (Campbell-NWWA)
W74-09526

DIGGING INTO MINE WASTE.
Environmental Science and Technology, Vol 8, No 2, p 110-111, February 1974. 2 fig.

Descriptors: *Mine wastes, *Mine water, *Mine acids, Talus, Pollutants, Pollution abatement, Waste disposal, Mine drainage.
Identifiers: Tailings, Mound stabilization.

The Department of the Interior projects that by the year 2000, more than 30 million acres in the U.S. will be affected by mining operations. The disposal of the solid waste, and the treatment of polluting mine waters from large scale operations represents a major threat to the environment. Acid or alkaline mine waters created by the disruption of stable aquifer and stream systems must be neutralized if possible. In those mining operations where water plays an integral part in the mining operations, it must be cleared before it is discharged. Solid wastes in the form of tailings represent a major eyesore and a potential pollutant of air and water. The immediate problem with solid mine wastes is to stabilize them against dusting and slumping. Using solid mine waste as a raw material is another approach in dealing with spoil piles. In the future, mine tailings might be used as a growing medium for grasses and brush after being disposed of in low-lying areas. New innovative approaches to surface mining that minimize environmental disturbance are needed for future mining operations. (Martino-NWWA)
W74-09531

SUBSURFACE DISPOSAL OF WASTE IN CANADA, INJECTION OF LIQUID WASTES IN DEEP WELLS, A PRELIMINARY APPRAISAL,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
R. O. Van Everdingen, and R. A. Freeze.
Technical Bulletin No. 39, 1971. 64 p, 7 fig, 3 tab, 4 append.

Descriptors: *Waste disposal, *Underground waste disposal, *Injection wells, *Canada, Water pollution sources, Liquid wastes.
Identifiers: *Subsurface disposal, Disposal sites.

A general appraisal is presented of the principal limitations of the potential of subsurface disposal. A discussion of the qualification of waste for subsurface disposal is followed by a review of the criteria to be applied for the proper selection of disposal regions, sites and geologic formations, and chapters on subsurface facilities and their potential failures. After a review of the method in Canada, requirements in the field of legislation and regulation are outlined, followed by a discussion of those aspects of the methods that are in need of further research. (Martino-NWWA)
W74-09536

PREVENTING LANDFILL LEACHATE CONTAMINATION OF WATER,
Gulf South Research Inst., Baton Rouge, La.
For primary bibliographic entry see Field 5G.
W74-09539

BACTERIOLOGICAL WATER QUALITY AND INCIDENCE OF WATERBORNE DISEASES IN A RURAL POPULATION,
S. N. Medical Coll., Agra (India).
For primary bibliographic entry see Field 5C.
W74-09540

ON THE CHARACTERIZATION OF THE PARASITE FAUNA OF YELLOW PERCH (PERCA FLUVIATILIS L.) IN FIVE LAKES, IN SOUTHERN ONTARIO, CANADA,
Waterloo Univ. (Ontario). Dept. of Biology.
S. Tedla, and G. H. Fernando.
Helminthologia (Bratisl), 11. p 23-33, 1970.
Identifiers: Acanthocephala, *Canada, Cestoda, Copepoda, Digenea, Fauna, Hirudinea, Lakes, Monogenea, Nematoda, Pelecypoda, Perca-fluviatilis, *Yellow perch, *Fish parasites.

Monogenea, Digenea, Cestoda, Nematoda, Acanthocephala, Pelecypoda, Hirudinea and Copepoda parasites were found in the yellow perch in the Bay of Quinte, Lake Opeongo, Lake on the Mountain, Sunfish Lake and Belwood Lake. The problem of composition of the parasite fauna cannot be assessed fully on the evidence of the parasite fauna of any 1 species of fish or 1 water body.--Copyright 1973, Biological Abstracts, Inc.
W74-09541

WATER SUPPLY IMPROVEMENT PROJECT,
Ohio Dept. of Health, Columbus. Div. of Sanitation.
J. D. Daulton, and D. E. Kos.
Appalachian Regional Commission, Final Report, 1973. 165 p, 73 fig, 36 tab, 27 ref, 6 append. Grant 05H 00009401, ARC 202 funding.

Descriptors: Sampling, Water pollution sources, *Water supply, Sewage treatment, *Ohio.
Identifiers: *Community hygiene, Health planning, Environmental health.

Preliminary results are presented of a survey of private water supplies in seven counties served by the Ohio Valley Health Services Foundation. These counties include: Athens, Gallia, Hocking, Jackson, Lawrence, Meigs, and Vinton. The project was a voluntary program of sampling and collection of information regarding the private water developments in the area. Data were collected and stored on computer print-outs and tapes for future reference. It was found that 48.3% of the water supplies tested positive for coliform bacteria and therefore, were considered unsafe. The random distribution of the safe and unsafe water samples are interpreted to mean that groundwater pollution is not the principal cause for unsafe water. Sampled water supplies analyzed for nitrates were found to be less than the Public Health Service recommended maximum of 45 mg/l. (Campbell-NWWA)
W74-09542

GROUNDWATER QUALITY. DOOR COUNTY, WISCONSIN.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
Report 7, May 1973. 215 p, 9 fig, 33 tab, 13 plates, 16 ref.

Descriptors: *Groundwater, *Water quality, *Economic impact, *Recreation, *Wisconsin, Institutional constraints, Physical properties, Social aspects, Land use, Public health, Legislation, Waste water disposal, Septic tanks, Water supply, Control, Regional development, Environmental effects, Economics, Social values, Sewerage, Waste water treatment, Zoning, Costs, Tourism.
Identifiers: *Door County(Wis.), Economic development.

Trade-offs between economic development, groundwater quality, and growing tourism is explored for a portion of Door County, Wisconsin. A land use suitability study of the region was conducted. While the area provides diversified terrain, vegetation, and soil types, only about 8% of the total study area can support conventionally installed septic tanks while 23% utilize modified home systems. Soil evidence suggests that the corridor should be closely regulated to prevent future groundwater degradation. The effectiveness of Wisconsin public health controls and local organizations and institutions designed to control waste disposal systems is evaluated. Lack of staff, varying test procedures, and lack of waste disposal alternatives are among problems cited. The applicability of land use control devices including zoning, differential taxation, and easements to preserve water quality is assessed. The environmental impact resulting from continued development in the county are identified and the impact of declining water quality on tourism is evaluated; tourist surveys indicate potential losses if water quality continues to decline. Finally, the potential for public sewage and water systems in Door County is described including construction difficulties, funding sources, and possible costs. (Schroeder-Wisconsin)
W74-09565

CHEMICAL DESCRIPTIONS OF THE OCEANS,
Scripps Institution of Oceanography, La Jolla, Calif.
E. D. Goldberg.
Technology Review, Vol 72, No 8, p 25-29, June 1970, 4 fig.

Descriptors: *Sea water, *Water pollution, *Oceans, Marine biology, Aquatic life, Aquatic plants, Radioactive waste disposal, Mercury, Lead, DDT, Foods.
Identifiers: Marine chemistry.

A general essay is presented on the chemical makeup of the oceans and what has been and is being done to use these resources wisely and deal effectively with misuse and contamination. Sodium chloride has been extracted from the oceans for centuries, but recently other elements such as magnesium and bromine are being commercially removed from sea water, and in the very near future, one of the most important constituents of sea water worthy of mining may be the water itself. Living organisms of the sea constitute a valuable food source to man, because the primary production of organic matter by the photosynthesizing plants of the sea yields a food base for the higher organisms. The nuclear era has significantly widened knowledge of the composition of sea water. There is no evidence that radioactive pollutants from nuclear power plants have had any widespread adverse effects on marine communities, and these additions of radioactivity provide convenient tags on the movements of waters and sediments. The main danger facing oceans today is the inputs by man, such as lead, mercury, pesticides and oil, which have equaled or exceeded inputs by rivers. Monitoring pollution now forms a most significant area of investigation in marine chemistry. (Jernigan-Vanderbilt)
W74-09570

MERCURY AND OTHER METALS IN BRITISH SEALS,
Institute for Marine Environmental Research, Lowestoft (England). Fisheries Lab.
P. B. Heppleston, and M. C. French.
Nature, Vol 243, No 5402, p 302-304, June 1973. 2 fig, 4 tab, 11 ref.

Descriptors: *Marine animals, *Mammals, *Mercury, Heavy metals, Lead, Cadmium, Analytical techniques, Testing procedures, Spectroscopy, Laboratory tests, Distribution, *Metals.
Identifiers: *Seals, *United Kingdom.

Soft-tissue samples taken from ninety-six seals, both common seals and grey seals, from six sites around Britain between February 1968 and January 1972 were analyzed for mercury and other heavy metals. The following conclusions are suggested: mercury reaches a ceiling level in brains at about 12-18 months; residues in man reach similar levels and also show no correlation with age. Mercury tends to accumulate in the liver, with age, reaching fairly high levels. Cadmium accumulates in the kidney, as it does in man, where it is known to occur in higher concentrations than in other organs. There do not seem to be regional differences in metal concentrations in the teeth, but some metals were found in greater quantities in younger seals than in old ones, probably related to the pattern of tooth growth. Regional differences in the amounts of mercury in the tissues do not seem to be related to possible agricultural or industrial pollution. The importance of taking age into account when studying the amounts of metals in biological tissues is stressed. (Jernigan-Vanderbilt)
W74-09571

A SURVEY OF TRACE METALS IN HUMAN HAIR,
Lamar Univ., Beaumont, Tex. Dept. of Chemistry.
E. A. Eads, and C. E. Lambdin.
Environmental Research, Vol 6, p 247-252, 1973. 5 tab, 9 ref.

Descriptors: *Lead, *Mercury, *Cadmium, *Zinc, *Industrial wastes, Spectrophotometry, Toxicity, Public health, Laboratory tests, Distribution, *Texas, Trace elements.
Identifiers: Atomic absorption spectroscopy, *Human hair, Port Arthur(Tex).

Metals of recent concern: Pb, Hg, Cd, Ni, Mn, Zn, and Cu (products of industrial pollution and auto exhaust emissions which enter the body through various means) were determined in selected hair samples from subjects from the petroleum and petrochemical complex of Port Arthur, Texas. Men's samples representing ages 9-60 yrs and emale samples representing ages 13-72 yrs were taken. They were soaked and rinsed in de-ionized water and in methanol to remove impurities, after which atomic absorption spectrophotometry was used to determine trace metal content. The data from the environmental studies offered a correlation of metals concentration as a function of hair color and age. Zinc and copper appear to be more related to natural hair pigmentation than the environmental levels. In both male and female samples Cd, Ni, Mn, and Cu were fairly uniformly distributed while extensive variations were observed for Pb, Hg, and Zn. The concentration of lead in the hair of males seemed to increase with the age, but no other trends were apparent in the male subjects. Reasonably close agreement between determined and published values was noted for all metals except lead. This is attributed to the higher airborne lead content in a gasoline production center. (Jernigan-Vanderbilt)
W74-09573

MERCURY IN TUNAS: A REVIEW,
Inter-American Tropical Tuna Commission, La Jolla, Calif.
C. L. Peterson, W. L. Klawe, and G. D. Sharp.
Fishery Bulletin, Vol 71, No 3, p 603-613, 1973. 1 fig, 2 tab, 35 ref.

Descriptors: *Mercury, *Fish, *Toxicity, Public health, Contaminants, Organic compounds, Inorganic compounds, Distribution, Standards, *Reviews.
Identifiers: Concentration, *Tuna.

Mercury in the aquatic environment comes from both natural processes and industrial activities. The latter probably have not significantly altered the mercury content of the high seas where most tunas are captured. Mercury compounds enter aquatic organisms through the food web and/or by direct extraction from solution. The relative importance of these pathways in tunas is unknown. Mercury occurs in tuna principally in the form of methylmercury. Generally, tunas appear to have higher mercury levels than those fish species which occupy a lower level in the food chain. Mercury content of tunas varies according to fish size. However, other factors such as area of capture, differential growth rates, varying analytical techniques, and different sampling methods may account for some of the observed variation. The U.S. Food and Drug Administration has established an 'in-house' standard of 0.5 ppm of mercury for fishery products sold in the United States. Other countries have established limits as high as 1.0 ppm. (Jernigan-Vanderbilt)
W74-09574

EXCRETION AND ABSORPTION OF METHYL MERCURY AFTER POLYTHIOL RESIN TREATMENT,
Rochester Univ. Medical Center, N.Y. Dept. of Radiation Biology and Biophysics.
For primary bibliographic entry see Field 5C.
W74-09575

CADMIUM: MODE OF OCCURRENCE IN ILLINOIS COALS,
Geological Survey, Urbana, Ill.
H. J. Gluskoter, and P. C. Lindahl.
Science, Vol 181, p 264-266, July 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Cadmium, *Coals, *Zinc, Analytical techniques, Laboratory tests, Testing procedures, Spectroscopy, Distribution, *Illinois, Trace elements.
Identifiers: Sphalerites.

In an investigation of the potentially volatile trace elements in coals relatively high Cd and Zn concentrations were found in several Illinois coals. All coal samples analyzed were either face channel or drill core samples and were representative of the entire coal seam, with the exception of mineral bands over 0.95 cm thick. The coals were ashed and then analyzed by atomic absorption spectrophotometry. The cadmium content of 23 Illinois coals ranges from less than 0.3 to 28 parts per million. The higher cadmium contents are found in coals that also have a relatively high zinc content (18 to 3100 ppm). Cadmium occurs in these coals in solid solution, replacing zinc in the mineral sphalerite (ZnS). The ratios of zinc to cadmium in sphalerites are similar to the ratios of zinc to cadmium in the whole coals from which the sphalerites were separated. (Jernigan-Vanderbilt)
W74-09578

HEAVY METAL ESTIMATION IN BIOLOGICAL SYSTEMS,
Bristol Univ. (England). School of Chemistry.
G. Nickless.
Chemistry and Industry, p 715-718, August 1973. 1 fig, 2 tab, 25 ref.

Descriptors: *Trace elements, *Toxins, *Organic matter, *Analytical techniques, Mercury, Mass spectrometry, Cadmium, Instrumentation, Colorimetry, Spectroscopy, Regulation, Monitoring.
Identifiers: Sample preparation.

Problems in determination of trace elements in water, air and biological systems include lack of standard procedures, necessity for different methods for different samples and the presence of trace amounts of heavy metals as essential to biological systems. Decomposition of the sample in preparation for analysis must be preceded by a consideration of the type material analyzed, the elements and forms analyzed for, precision and occuracy required, sample size, time allowed, cost and difficulty of analysis. Pros and cons of dry and wet decomposition, application of biological standards (orchard leaves or beef liver), and the three main groups of instrumental methods (electroanalysis, optical methods, and mass spectrometry and neutron activation analysis) are discussed briefly. Examples of the concentration power of organisms are given. Long-term sublethal hazards to heavy metals are just beginning to be noticed. A decision must be made whether to accept them as a hazard of the 20th century or to implement control at the source through tougher legislation. (Jernigan-Vanderbilt)
W74-09580

APPLICATION OF ERTS-1 IMAGERY IN THE VERMONT-NEW YORK DISPUTE OVER POLLUTION OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Remote Sensing Lab.
A. O. Lind.
Available from NTIS, Springfield, Va. 22151 as N74-11183, Price $3.00 printed copy; $1.45 microfiche. National Aeronautics and Space Administration Contract Report CR-135962, October 1973. 5 p, 1 fig, 3 ref. NASA Contract NAS 5-21753.

Descriptors: *Remote sensing, *Path of pollutants, *Lakes, *New York, *Vermont, Pulp wastes, Pulp and paper industry, Water pollution, Mapping, Legal aspects.
Identifiers: *Lake Champlain.

Three ERTS-1 images from different dates were used to document the effluent pattern in Lake Champlain emanating from the large papaer mill north of Fort Ticonderoga, N.Y. A composite map shows the plume. The State of Vermont is currently suing both the International Paper Company and the State of New York for degrading the waters of Lake Champlain in Vermont. Vermont proposed that the map and the enlarged reproductions of ERTS imagery be entered in evidence. The special U.S. Supreme Court Master accepted the ERTS imagery and the ERTS-derived information in evidence. This is the first time that satellite imagery and satellite-derived information have been used as evidence in a court of law. (Knapp-USGS)
W74-09585

AN OCEANOGRAPHIC OBSERVATION OF NEW YORK BIGHT FROM ERTS-1,
Atlantic Oceanographic and Meteorological Lab., Miami, Fla. Physical Oceanography Lab.
R. L. Charnell, and G. A. Maul.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. National Oceanic and Atmospheric Administration Technical Report ERL 262-AOML 9, February 1973. 8 p, 2 fig, 1 ref.

Descriptors: *Remote sensing, *Bays, *Path of pollutants, Water quality, Coasts, New York, Satellites(Artificial), Industrial wastes, Acids, Turbidity, Data collections.
Identifiers: *New York Bight, *ERTS.

The Earth Resources Technology Satellite (ERTS-1), made a transit over New York Bight on August 16, 1972. Imagery from this transit shows several oceanographic features that demonstrate the usefulness of remote sensing over a large area for the synoptic observation of changes in water quality in the coastal zone. Both the extent and turbulent character of the Hudson River plume are discernible. Residue from a dump of waste acid is visible over a 5-mile area in the apex of the bight. Little dispersion of this residue has occurred. This feature will be a persistent signature in images from future satellite transits. (Knapp-USGS)
W74-09589

GROUNDWATER POLLUTION.
Available from Underwater Research Institute Publications, 4331 Humphrey, St. Louis, Mo. 63116, $5.00. Underwater Research Institute, St. Louis, Missouri, 1973. 198 p.

Descriptors: *Water pollution sources, *Groundwater, *Conferences, Path of pollutants, New England, Lakes, Septic tanks, Coal mines, Acid mine water, Saline water intrusion, Farm wastes, New Mexico, Data processing, Legal aspects, Urbanization.

Groundwater pollution was discussed in a conference held at St. Louis in 1973. The subjects include the effects of artificial lakes on groundwater, coal mine pollution, septic tanks, saline water invasion of aquifiers, pollution by agriculture, pollution of the Ogallala aquifer, data processing, legal aspects, pollutant transport, and the environmental effects of urbanization in New England. (See W74-09591 thru W74-09598) (Knapp-USGS)
W74-09590

THE EFFECT OF AN ARTIFICIAL LAKE DEVELOPMENT COMPLEX ON THE GROUNDWATER SYSTEM,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
J. I. Hoffm .., and N. Meland.

In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 1-12, 1973. 6 fig, 2 tab, 4 ref.

Descriptors: *Water pollution sources, *Groundwater, *Lakes, *Artificial lakes, Land use, Surface-groundwater relationships, Urbanization, Water pollution control, *Wisconsin.
Identifiers: *Legend Lake(Wisc).

Lakes exceeding 1,000 acres are being created in response to a demand for recreational lake property. Legend Lake, a newly created 1,270-acre artificial lake near Keshena, Wisconsin, offered a unique chance to try to evaluate environmental, economic, and social aspects of man's influence on a lake and its surrounding area. A long-range program of monitoring water quality, shoreline erosion, plant growth, and changes in the groundwater system was begun in 1969, along with attempts to evaluate social and economic impact. Construction of Legend Lake caused an increase in the height of the groundwater table, which resulted in a tree kill. Groundwater flow was reversed in some areas, and those regions influenced by reversed flow will probably experience some increase in water hardness. The use of septic tanks near the shorelines of developed lakes appears to have stimulated eutrophication of many of these lakes. Tertiary sewage treatment or nutrient removal systems would better insure that groundwater and surface waters would remain free of pollution. (See also W74-09590) (Knapp-USGS)
W74-09591

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens. Dept. of Geology.
M. U. Ahmad.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 13-52, 1973.

Descriptors: *Water pollution sources, *Acid mine water, *Coal mines, Coal mine wastes, Strip mines, Ohio, Mine acids, Strip mine wastes, Hydrogeology, Path of pollutants.

Coal mining has seriously degraded the water quality of streams in Appalachia and other parts of the United States, and in some cases has also damaged underground aquifers. In general quality of the water draining from coal mines is dependent upon the thickness of the shale lying directly over the coal being mined. Water from mines that have a thin layer over the coal is often non-acid or only mildly acid, while the mines that have thick shale over the coal have drainage that is slight to very acid. The Sheban Mine (79 acres) is a typical coal mine and is described in detail to illustrate a typical problem of acid discharge. The mine is located in the N.E. Quarter of Goshen Township, Mahoning County, Ohio. Since water is the transport media for carrying acid and salts from the mine environment, reducing the amount of water passing through an underground mine will reduce the amount of pollution. Mine sealing reduces the production of acid by excluding air from pyrite materials to prevent their oxidation. This has proved to be relatively ineffective. (See also W74-09590) (Knapp-USGS)
W74-09592

SEPTIC TANKS AND GROUNDWATER POLLUTION,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. A. Minear, and J. W. Patterson.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 53-71, 1973. 4 fig, 4 tab, 51 ref.

Descriptors: *Water pollution sources, *Groundwater, *Septic tanks, Soil disposal fields, Path of pollutants, Bacteria, Viruses, Organic matter, Domestic wastes.

About 13 million private septic tanks are in use in the United States today, with an additional half million being installed each year. This wide use of septic systems has persisted in the face of a consistent history of septic tank failure and the almost unanimous disapproval by public health engineers of their use in any except the most isolated households. Estimates of the number of septic tanks performing inadequately range up to 50% of those in use today. These malfunctional systems constitute a severe public health hazard and a major source of contamination of the environment. The most critical environmental effect of septic systems is contamination of groundwater and private well supplies. The soil is the primary treatment process of the septic system, and if the soil becomes clogged and overloaded with sewage, the system will quickly fail, with attendent health hazard, sanitary nuisance, and environmental pollution. (See also W74-09590) (Knapp-USGS)
W74-09593

POLLUTION OF GROUNDWATER BY SALT INVASION,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A.-A. I. Kashef.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 72-89, 1973. 12 fig.

Descriptors: *Saline water intrusion, *Groundwater, Aquifers, Hydrogeology, Withdrawal, Path of pollutants, Groundwater movement, Water pollution control, Artificial recharge, Groundwater barriers, Saline water barriers, Saline water-freshwater interfaces.

Coastal aquifers that have their boundaries in contact with saltwater bodies are invaded by saltwater. The extent depends upon climatic conditions, the characteristics of the natural flow within these aquifers, and the manner of groundwater usage. The invaded zones increase in size with overdraft of groundwater. The main known remedial measures are limiting water usage, artificial recharge, hydraulic barriers, pumping troughs, cutoff walls (or underground dams), and direct saltwater removal. (See also W74-09590) (Knapp-USGS)
W74-09594

GROUNDWATER POLLUTION BY AGRICULTURE,
Louisiana Tech. Univ., Ruston. Dept. of Agricultural Engineering.
J. W. D. Robbins, and G. J. Kriz.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 91-114, 1973. 2 tab, 97 ref.

Descriptors: *Water pollution sources, *Groundwater, *Farm wastes, Fertilizers, Return flow, Pesticides, Water pollution control, Soil water.

Agricultural enterprises produce wastes that may lead to rapid degradation of groundwater. Since most agricultural wastes are released at or slightly below the ground surface, water-table aquifers are especially vulnerable to contamination. Five major categories of agricultural groundwater pollutants are animal wastes, fertilizers, pesticides, plant residues, and saline irrigation-waste waters. Suggested approaches to solution of the problem include: detailed studies of a few representative sites, synthesis of results of research applicable to the problems, analyses of specific sites before commitments to water and waste projects have been made, evaluation of specific sites after contamination has occurred; and background studies for gaining an understanding to utilize the technology to control the undesirable degradation of groundwater. (See also W74-09590) (Knapp-USGS)
W74-09595

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
Eastern New Mexico Univ., Portales. Dept. of Biological Sciences.
P. D. Bigbee, and R. G. Taylor.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 115-131, 1973. 6 fig, 17 ref.

Descriptors: *Water pollution sources, *Aquifers, *Groundwater, *New Mexico, Fertilizers, Septic tanks, Farm wastes, Water quality, Nitrates, Coliforms, Path of pollutants.
Identifiers: *Portales(NM).

The Ogallala Aquifer is polluted at Portales, N.M. The bacterial contamination of the aquifer is caused by cesspool and septic tank pollution and feedlot runoff. The nitrate concentrations in almost all wells sampled are above 10 ppm, and six of the wells are above 45 ppm. A large number of the irrigated fields in the Portales area are fertilized with ammonia which can be oxidized by the soil bacteria to form nitrates. Nitrates are water soluble and are not complexed by soil; therefore, they are easily leached from the soil and transported by water. The summer months are the time of year in Portales when irrigation is at its maximum, and a large amount of water is pumped onto the fields. (See also W74-09590) (Knapp-USGS)
W74-09596

POLLUTANT TRANSPORT AND ACCUMULATION PROCESSES IN OUR ENVIRONMENT--THE GENERAL THEORY AND A CASE STUDY OF MERCURY FROM THE FOUR CORNERS ELECTRIC POWER PLANTS AND IN NAVAJO LAKE, NEW MEXICO,
National Aeronautics and Space Administration, Albuquerque, N. Mex.
C. L. Hyder.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 159-173, 1973. 11 ref.

Descriptors: *Mercury, *Air pollution, *Water pollution sources, *Thermal powerplants, Coals, *New Mexico, Trace elements, Poisons, Lakes, Surface waters, Path of pollutants, Groundwater.
Identifiers: *Navajo Lake(N.M.).

Powerplant generation of pollutants, atmospheric transport processes, and topographical and biological concentration processes were studied theoretically. The results are applied to the coal-burning electric powerplants near Four Corners, New Mexico. The total amount of mercury produced by the powerplants and transported into a nearby lake (Navajo Lake, New Mexico) was predicted and compared with the total amount of mercury measured in Navajo Lake. The near-equilibrium concentrations of mercury in Navajo Lake were also compared with the predictions. The Four Corners electric powerplants are probably significant contributors to the mercury measured in fish taken from Navajo Lake. The same may be true of the San Juan arm of Lake Powell, Utah. (See also W74-09590) (Knapp-USGS)
W74-09597

SOME POTENTIAL ENVIRONMENTAL PROBLEMS FROM POPULATION EXPLOSION AND URBAN DEVELOPMENT IN MAS-

SACHUSETTS AND ADJACENT PARTS OF NEW ENGLAND,
Massachusetts Univ., Amherst. Dept. of Geology.
W. S. Motts.
In: Groundwater Pollution; Proceedings of Groundwater Pollution Conference, October 1971, St. Louis, Missouri: Underwater Research Institute, St. Louis, p 174-198, 1973. 8 fig, 2 tab, 23 ref.

Descriptors: *Water pollution sources, *Groundwater, *New England, Chlorides, Landfills, Garbage dumps, Salts, Deicers, Urbanization, Path of pollutants, Snow removal, *Massachusetts.

Some potential groundwater and environmental problems in Massachusetts and adjacent parts of New England may develop as an indirect result of an increase of population accompanied by increased housing and urban development, a proliferation of roads and highways, more landfills, and more industries. The nature and magnitude of these environmental problems are influenced to a large extent by the characteristic geology, soil types, vegetation, groundwater occurrence, and climate of the New England Topographic Province. The increase of chlorides in groundwater supplies is the result of addition of salts to highways, increases in general pollution due to additional domestic septic tank usage, increases of town dumps, the drought from 1960 through 1967, and effects of air pollution which increases the chloride content in precipitation. (See also W74-09590) (Knapp-USGS)
W74-09598

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
E. F. Yost.
Available from NTIS, Springfield, Va. 22151 as E73-10819 - Price $3.00 printed copy; $1.45 microfiche. Interim Report to NASA Goddard Space Flight Center, June 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, *Water quality, *Estuaries, Satellites(Artificial), Turbidity, Sewage disposal, Path of pollutants, *New York.
Identifiers: *Block Island Sound(NY), ERTS.

ERTS-1 imagery of New York coastal waters was photographically enhanced to emphasize apparent water color differences. Water samples were collected simultaneously with the acquisition of satellite data. Water turbidity, particularly that arising from sewage dump areas, and sediment discharge from coastal inlets correlate well with the ERTS-1 color signatures. (Knapp-USGS)
W74-09602

CLOUD SEEDING FOR SNOW AUGMENTATION: LAND USE RAMIFICATIONS OF RESIDUAL SILVER IODIDE NUCLEATING AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
D. A. Klein, and R. A. Sokol.
Proceedings for sale by Western Snow Conference, R. T. Davis, Secretary, Rm. 360, U.S. Courthouse, Spokane, Wash. 99201 - Price $3.00. In: Proceedings of the 41st Annual Meeting of the Western Snow Conference, April 17-19, 1973, Grand Junction, Colorado: Colorado State University, Fort Collins, p 30-36, 1973. 3 fig, 7 ref.

Descriptors: *Path of pollutants, *Cloud seeding, *Silver iodide, *Soil microbiology, Soil microorganisms, Soil environment.

In seeding winter storms in the Western USA, a possible concern in land use planning involves the potential effects residual silver iodide nucleating agents may have on soil microbial processes. If a seeding rate of 0.02 gram of silver/ha/cm of precipitation is used, then 60 cm of seeded precipitation could deliver 1.2 grams of silver as silver iodide/ha/year, or 0.12 mg of silver per surface square meter. Effects of varied silver forms on soil microbial respiration processes were carried out by use of a simplified respirameter using undisturbed surface soil cores of 6.5 cm diameter and 8.0 cm depth obtained in the Fort Collins area. Silver in the forms of silver iodide and silver nitrate were added to soils as acetone and water solutions respectively, and respiration indices were carried out over 10-day periods at 25 deg C in the dark. Silver iodide added to soils directly as a fine powder did not have discernible effects on soil respiration processes when carried out over short-term experiments. Up to 1.0 gram of silver iodide added to 100 grams of soil was not able to cause discernible decreases in all-over microbial respiration rates. Addition of silver in the form of silver nitrate, a freely-soluble silver form, was capable of causing discernible decreases in soil respiration rates when added at 1.0 ppm, and essentially complete cessation of microbial respirations occurred when 100 ppm were used, indicating that the form of silver added to a natural environment is more important than the total amount added. (Knapp-USGS)
W74-09606

CHANGES IN OXYGEN AND PRIMARY PRODUCTION OF THE PATUXENT ESTUARY, MARYLAND, 1963 THROUGH 1969,
Geological Survey, Edgewater, Md.
R. L. Cory.
Chesapeake Science, Vol 15, No 2, p 78-83, June 1974. 4 fig, 1 tab, 16 ref.

Descriptors: *Dissolved oxygen, *Primary productivity, *Eutrophication, *Estuaries, *Maryland, Respiration, Water temperature, Water pollution effects.
Identifiers: *Patuxent Estuary(Md).

Water quality was monitored from 1963 through 1969 in the upper-middle Patuxent estuary, near Benedict, Maryland. Over the period of record, a pronounced change occured in the diel oxygen measurement, particularly during the months of July, August, and September. Annual variations of dissolved oxygen ranged from 3.6 to 15.0 mg per liter in 1964 and from 2.3 to 16.5 mg per liter in 1969 with percentage saturation varying from 60% to 130% in 1964 and from 30% to 184% in 1969. The magnitude of diel summer oxygen variation changed from about 3 to 7 mg per liter per day over the same period. From hourly values of temperature, oxygen, and conductivity, gross primary production (GP) and respiration (R) were estimated. From the seasonal data, GP ranged from about 3 to 25 g of oxygen per sq m per day, and R ranged from about 4 to 32 g of oxygen per sq m per day. On average days, GP ranged from 2 to 10 g of oxygen per sq m per day in 1964 and from 1 to 16 in 1969. In 1964, daily average GP was 5.2 grams of oxygen per sq m per day as compared to 6.1 in 1969, and respiration was 6.1 grams of oxygen per sq m per day in 1964 versus 10.2 grams of oxygen per sq m per day in 1969, increases of 20% and 16%, respectively. Ratios of GP/R averaged 0.84 in 1964 versus 0.60 in 1969, reflecting a larger respiration in 1969 and suggesting a trend towards community instability. The increases in production were attributed to upstream domestic waste loading. If the present trend increases, metabolic imbalance and anaerobic conditions may develop. (Knapp-USGS)
W74-09624

PHYSICAL AND CHEMICAL CHARACTERISTICS OF SURFACE MINE SPOIL TREATED WITH FLY ASH,
Northeastern Forest Experiment Station, Princeton, W.Va.
W. T. Plass, and J. P. Capp.
Journal of Soil and Water Conservation, Vol 29, No 3, p 119-121, May-June 1974. 3 fig, 3 tab, 4 ref.

Descriptors: *Mine wastes, *Fly ash, *Waste dumps, *Land reclamation, *Strip mines, Water pollution control, Nutrients, Soil moisture, Infiltration, Vegetation.

Use of powerplant fly ash for surface mine reclamation offers an attractive outlet for large tonnages of this waste material. Research by the U.S. Bureau of Mines beginning in 1963 showed that fly ash could be used to neutralize extremely acid surface mine spoil. The agency's treatments favored establishment of grass and legume cover by modifying chemical and physical characteristics of the spoil. Changes that occurred in a spoil following the application of 150 tons of fly ash per acre are described. The treatment neutralized acidity, added plant-available phosphorus, lowered spoil density, and increased subsurface moisture. (Knapp-USGS)
W74-09631

ANTIMONY IN GROUNDWATER OF THE KADAMDZHAY DEPOSIT (SUR'MA V PODZEMNYKH VODAKH KADAMDZHAYSKOGO MESTOROZHDENIYA),
Tomsk Polytechnic Inst. (USSR).
For primary bibliographic entry see Field 4B.
W74-09648

CHEMICAL STUDIES OF SOLIDS, RUNOFF, SOIL PROFILE AND GROUNDWATER FROM BEEF CATTLE FEEDLOTS AT MEAD, NEBRASKA,
T. M. McCalla, J. R. Ellis, C. B. Gilberston, and W. R. Woods.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 211-223 (1972). 5 fig, 5 tab, 5 ref.

Descriptors: *Feed lots, *Agricultural runoff, *Soil profiles, Slopes, *Continuous flow, Chemical properties, Groundwater, Nitrogen, Phosphorus, Solid wastes, *Cattle, *Nebraska, *Farm wastes.
Identifiers: Batch system, Settleable solids, Cattle density, Electrical conductivity, Mead(Neb.).

A 4-year study at Mead, Nebraska, was made to determine the effects of cattle density and slope on possible pollution of surface water, soil profile, and groundwater from beef cattle feedlots. The batch system and the continuous flow system were used for removal of settleable solids from runoff. Chemical analyses were made of the wastes and runoff produced by these two systems. Conclusions were: (1) Feedlot runoff transports excess nutrients and must not be discharged into streams. (2) The quantity of volatile solids and nitrogen and phosphorus removal rates from the feedlot surface were proportional to stocking rate during mechanical cleaning. (3) An increase in the slope of the feedlot increased the quantity of total solids, volatile solids, nitrogen, and phosphorus removed from the feedlot. (4) The runoff data on these lots indicate that the variability is too great to determine the effect of feedlot slope on runoff quantity and quality. (5) Beef cattle feedlots with heavy, constant stocking on loess hills do not create a groundwater problem, but nitrate buildup was found in profiles of adjacent areas. (6) The soil texture of the retention structure and the procedure and materials used to seal the structure are necessary considerations in preventing nitrate accumulations in the soil profile and groundwater. (See also W74-09663) (Marquard-East Central)
W74-09680

BEEF BARNLOT RUNOFF AND STREAM WATER QUALITY,
Ohio Agricultural Research and Development Center, Worster.
R. K. White, and W. M. Edwards.

In: Waste Management Research Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 225-235 (1972). 6 fig, 1 tab, 6 ref. OWRR A-023-OHIO(2).

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Water quality, *Cattle, *Ohio, *Farm wastes, Water quality standards, Solid wastes, Waste water treatment.
Identifiers: *Barnlot runoff, Volatile solids, Total solids, Clarksburg silt loam.

Objectives were to determine the concentration and amounts of solids and organic material in the runoff from a barnlot and to identify the effect of rainfall and runoff patterns and seasonal conditions on barnlot runoff quality. Runoff for a 16-month period from a 60 head beef cattle barnlot located on silt loam was sampled and analyzed for total solids (TS), volatile solids (VS), biochemical oxygen demand (BOD), and chemical oxygen demand (COD). Runoff usually occurs when rainfall exceeds .5 inches. Transport of TS is related to the volume of runoff. BOD concentration and transport are larger in winter and smaller in summer except for the periods following dry antecedent conditions. Concentrations of TS, BOD, and COD are variable within a runoff event. Average yearly runoff, based upon 3 year records, is presented. A yearly BOD concentration curve for runoff is projected. An estimate of yearly transport of BOD can be projected from these two relations. (See also W74-09663) (Marquard-East Central)
W74-09681

INITIAL OBSERVATIONS OF SEVERAL MEDIUM SIZED BARRIERED LANDSCAPE WATER RENOVATION SYSTEMS FOR ANIMAL WASTES,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5D.
W74-09695

CONTRIBUTION OF ANIMAL WASTE TO NITRATE NITROGEN IN SOIL,
Pennsylvania State Univ., University Park.
L. F. Marriott, and H. D. Bartlett.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 435-440, (1972). 1 fig, 2 tab, 1 ref.

Descriptors: *Farm wastes, *Waste disposal, *Nitrogen, Soils, Rates of application, *Slurries, Water pollution, Groundwater, Dairy industry, Odor, *Waste water treatment, Path of pollutants.
Identifiers: Hagerstown silt loam, Suction lysimeters, *Nitrate nitrogen.

Research was done to determine the movement and accumulation of nitrate nitrogen in soil after dairy manure slurry was applied below the surface of grass sod. Odor control was also to be determined. A liquid spreader spread slurry of 12.5% solids and 2.35% total N (dry matter basis) four inches below surface at treatment rates of 0, 15, 30, 45, 60, and 75 tons of moisture. Suction lysimeters were installed in each plot at depths of 1, 2, 3, and 4 feet for the purpose of sampling soil water. Samples were taken at 14 day intervals in 1970 and at monthly intervals in 1971. Soil samples were also taken. Both types of samples were analyzed for nitrate, ammonium nitrogen, chloride, and sodium. Even the lowest application rate of 15 tons per acre indicated enough nitrate excess to be a potential pollution hazard. Disposal of wastes in this manner practically eliminated odors. (See also W74-09663) (Marquard-East Central)
W74-09697

GRASS RESPONSE TO APPLICATIONS OF BEEF-CATTLE FEEDLOT RUNOFF,
For primary bibliographic entry see Field 5D.
W74-09700

SURFACE RUNOFF NUTRIENT LOSSES FROM VARIOUS LAND DISPOSAL SYSTEMS FOR DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
P. J. Zwerman, S. D. Klausner, D. R. Bouldin, and D. Ellis.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 495-502, (1972). 3 tab, 12 ref. EPA 13030 DPB.

Descriptors: *Agricultural runoff, *Waste disposal, *Farm wastes, *Nitrogen, *Phosphorus, Nitrates, Dairy industry, Crop rotations, Corn(Field), Alfalfa, Oats, Wheat, Organic matter, Rainfall simulators.
Identifiers: Nutrient losses, Soil loss, Orthophosphates.

Sixty randomly selected plot locations were subject to surface runoff tests with a rainfall simulator. Storm frequencies corresponding to 2, 10, and 20 years were applied in sequence to each plot. Soil condition results represent the effects of fourteen years of past management on seed beds prepared for corn. Heavy mineral fertilization increased runoff by 50%. Lack of a 6 ton manure application increased runoff 100%. Orthophosphate was increased by increased phosphate fertilizer. Runoff, nitrate, and orthophosphate increased with rain application. Increased mineral fertilization doubled the losses of soil, organic matter, total nitrogen, and total phosphorus. Six ton manure applications cut these losses in half. All losses increased with increased water applications. A two-by-four factorial analysis study again involved six tons of manure plowed down versus no manure on four crop rotations. All were at moderate rates of mineral fertilization. The rotations were: (1) continuous corn; (2) corn-corn-oats-alfalfa-alfalfa; (3) corn-oats-alfalfa-alfalfa; and (4) wheat-alfalfa-alfalfa-alfalfa-alfalfa. Manure effect in these rotations was non-significant. In (1) and (4), manure decreased or did not effect runoff, soil, and nutrient losses. In (2), manure significantly increased organic matter and total nitrogen loss. It increased runoff, nitrates, soil loss, and total phosphorus. In (3), manure significantly increased total phosphorus. It decreased nitrate. It increased soil loss, organic matter, and total nitrogen. (See also W74-09663) (Marquard-East Central)
W74-09702

55FE CONCENTRATION AND SPECIFIC ACTIVITIES IN NORTH PACIFIC MARINE ORGANISMS,
Battelle-Pacific Northwest Lab., Richland, Wash.
For primary bibliographic entry see Field 5C.
W74-09733

WATER POLLUTION PREVENTION IN SOUTH WALES,
Wales Directorate of Engineering (England).
For primary bibliographic entry see Field 5G.
W74-09735

STUDIES OF THE SEASONAL VARIATION OF THE SUSPENDED MATTER OF THE MENAI STRAITS. II. MID STREAM DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
S. Buchan, G. D. Floodgate, and D. J. Crisp.
Deutsche Hydrographische Zeitschrift, Vol 26, No 2, p 74-83, January, 1973. 9 fig, 2 tab, 3 ref.

Descriptors: *Correlation analysis, *Suspended load, Tidal streams, Water temperature, Wind tides, *Organic matter, Inorganic compounds, Bottom sediments, Turbidity, *Sediment load.
Identifiers: Surface sediments, *Menai Straits.

Surface and bottom inorganic and organic suspended loads in the Menai Straits were correlated with hydrographic and meteorologic elements which impart an influence on them. Surface inorganic loads correlated significantly with tidal range, water temperature, and run of wind. This latter factor did not relate well with the bottom inorganic fraction. Significant correlations were evident between surface and bottom organic loads and the tidal range. Turbidity and suspended sediment load were also investigated. (Sandoski-FIRL)
W74-09741

APPLICATION OF REAL-TIME MASS SPECTROMETRIC TECHNIQUES TO ENVIRONMENTAL ORGANIC GEOCHEMISTRY. II. ORGANIC MATTER IN SAN FRANCISCO BAY AREA WATER,
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 5A.
W74-09742

U.S. COAST GUARD OIL POLLUTION INVESTIGATION AND CONTROL SCHOOL.
Coast Guard, Yorktown, Va.
For primary bibliographic entry see Field 5G.
W74-09753

LEAD, CD, ZN, CU, AND CO IN STREAMS AND LAKE WATERS OF CAYUGA LAKE BASIN, NEW YORK.
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
J. Kubota, E. L. Mills, and R. T. Oglesby.
Environmental Science and Technology, Vol 8, No 3, p 243-248, March, 1974. 4 fig, 6 tab, 21 ref.

Descriptors: *Heavy metals, *Lead, *Cadmium, *Zinc, *Copper, *Cobalt, Lakes, *New York, Surface waters, Spatial distribution, Seasonal, Trace elements, Sediment transport, *Trace elements, Path of pollutants.
Identifiers: *Cayuga Lake basin(NY).

Waters of 12 tributary streams of Cayuga Lake were studied to determine the levels and seasonal and geographic patterns of trace elements in the Cayuga Lake basin, a primarily rural area. Trace elements in soluble form (filtered water) and in suspended particulates were studied. The trace element concentrations were generally low, but a seasonal pattern reflecting higher concentrations with high stream flow was noted in the case of Pb. Values for streams of rural areas reflect levels associated with normal geochemical processes and soil weathering. An impact of urbanization was reflected in higher levels of the trace elements in suspended particulates carried by these streams that flow through Ithaca, N.Y. A basis has been established to evaluate changes in trace elements load with future changes in land use and urbanization. (Jernigan-Vanderbilt)
W74-09762

MIGRATION AND REDISTRIBUTION OF ZINC AND CADMIUM IN MARINE ESTUARINE SYSTEM,
Geological Survey, Corpus Christi, Tex.
C. W. Holmes, E. A. Slade, and C. J. McLerran.
Environmental Science and Technology, Vol 8, No 3, p 255-257, March 1974. 10 fig, 2 tab, 11 ref.

Descriptors: *Zinc, *Cadmium, *Migration patterns, *Distribution patterns, Trace elements, Water analysis, *Path of pollutants, Coasts, Spatial distribution, *Texas, Sediments, Estuaries, Spectroscopy.
Identifiers: Atomic absorption spectroscopy, Coastal management, *Corpus Christi Bay(Tex).

The estuarine sediments of Texas in Corpus Christi Bay have anomalously high concentrations of zinc and cadmium. Data are presented on the distribution of these elements in the sediments, their seasonal variations, and the pathways by which they move within the estuarine system. 287 sediment and 156 water samples were taken and

analyzed for zinc and cadmium by atomic absorption spectrophotometry. Sediment zinc concentrations in the bay ranged from a maximum of 235 ppm near the entrance of the harbor to a minimum of 6 ppm, and cadmium concentrations ranged from a high of 1.9 ppm to a low of 0.1 ppm. In the harbor sediments, zinc ranged from a maximum of 11,000 ppm, approximately 8 km from the harbor entrance to a minimum of 235 ppm at the entrance. Cadmium ranged from 130 ppm to 2 ppm. Correlation of 0.80 between the zinc and cadmium concentrations in the bay and harbor sediments indicated an identical source. The zinc and cadmium concentrations in the bay are the result of transfer from harbor sediments, mainly in winter, even after the effluent from industrial processes is stopped. (Jernigan-Vanderbilt)
W74-09777

GASTROINTESTINAL ABSORPTION OF DIFFERENT COMPOUNDS OF 115M CADMIUM AND THE EFFECT OF DIFFERENT CONCENTRATIONS IN THE RAT,
National Environmental Research Center, Cincinnati, Ohio. Environmental Toxicology Research Div.
For primary bibliographic entry see Field 5C.
W74-09778

OCCURRENCE OF LI, B, CU, AND ZN IN SOME EGYPTIAN NILE SEDIMENTS,
Goettingen Univ. (West Germany). Sediment-Petrographisches Institut.
M. M. Ashry.
Geochimica et Cosmoshimica Acta, Vol 37, p 2449-2458, 1973. 8 fig, 2 tab, 22 ref.

Descriptors: River systems, *Boron, *Clays, *Sediments, *Copper, *Zinc, Testing procedures, Analytical techniques, *Water analysis, Heavy metals, Spectroscopy, Colorimetry, X-ray fluorescence, Trace elements.
Identifiers: *Nile River, Egyptian delta, *Lithium.

Lithium, boron, copper and zinc have been determined on cored and surface sediments from the delta and the drainage valley of the Nile River. The clay size fraction separated from the samples consists of montmorillonite and kaolinite as the predominant clay components, followed by illite and chlorite. Quartz and calcite are the non-clay admixtures. Lithium content varies between 7 and 48 ppm in the bulk sediments and between 28 and 61 ppm in the clay fractions, being clearly enriched in the clay material. In the clay fractions, concentration of lithium in kaolinite is indicated by a close relation between the lithium and kaolinite contents and is further supported by a close correlation with Al2O3. Boron in the clay fraction (62-112 ppm) appears to be concentrated in detrital illite. The concentrations of copper (26-900 ppm) and zinc (65-333 ppm) in the clay fractions correlate positively with the CO2 percentage. Both elements tend to occur in or on the clay-sized grains of calcite. (Jernigan-Vanderbilt)
W74-09779

CADMIUM, NICKEL, LEAD, AND ZINC IN EARTHWORMS FROM ROADSIDE SOIL,
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Wildlife Refuges.
For primary bibliographic entry see Field 5C.
W74-09780

RELATION OF TRACE METALS TO HUMAN HEALTH,
Dartmouth Coll., Hanover, N.H. Dept. of Physiology.
For primary bibliographic entry see Field 5C.
W74-09790

PARTICULATE LEAD CONTAMINATION RECORDED IN SEDIMENTARY CORES FROM LAKE WASHINGTON, SEATTLE,
Washington Univ., Seattle. Dept. of Oceanography.
E. A. Crecelius, and D. Z. Piper.
Environmental Science and Technology, Vol 7, No 11, p 1053-1055, November 1973. 4 fig, 16 ref.

Descriptors: *Lead, Lakes, Sediments, Fir trees, *Path of pollutants, Water pollution sources, Spatial distribution, Temporal distribution, *Washington, *Lake sediments, Spectroscopy.
Identifiers: Atomic absorption spectroscopy, *Lake Washington(Wash).

The aim was to evaluate the present relative contribution of lead to the environment by autos and smelters and the relative change in the overall level of lead pollution from the time of the development of the Seattle area, approximately 1880, to the present. To estimate past levels of lead pollution in the area, two sedimentary gravity cores were taken from Lake Washington which forms the eastern boundary of Seattle. To identify present-day sources, the distribution of lead in the needles of Douglas fir trees in the vicinity of the Tacoma smelter (35 km SSW of the lake) and near and distant from major highways was determined. Both types of samples were measured by atomic absorption spectrometry. The lead concentration in the cores exhibits an increase from about 25 ppm at the 30-50 cm depth to about 400 ppm in near surface sediment; this represents a twenty-fold increase during the past 80 years. Much of this increase is probably due to lead additives in gasoline introduced during the 1920's. The highest lead values in the fir needle samples (100 ppm) were observed in those trees located near major highways. This distribution of lead supports the conclusion that automobiles represent the major source of lead pollution to the lake today. (Jernigan-Vanderbilt)
W74-09791

5C. Effects Of Pollution

BIOLOGICAL DEGRADATION OF HYDROCARBONS IN WATER,
Rhode Island Univ., Kingston. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-09254

AUDUBON BLACK PAPER NUMBER 1, OIL POLLUTION,
M. Zeldin.
Audubon, Vol 73, No 3, p 99-119, May 1971.

Descriptors: *Water Quality Act, *Legislation, *Oil spills, *Oil pollution, Water pollution, Disasters, Water law, Treaties, Oil industry, Offshore platforms, Drilling, Legal aspects, Regulation, Oil wastes.
Identifiers: *Oil Pollution Act, *Environmental Protection Agency, *International Convention for Prevention of the Pollution of the Sea by Oil, Water Quality Improvement Act.

In 1970, an estimated five million tons of crude oil or petroleum products were spilled into the waters of the world, half of the major spills occurring within one mile of shore. Tankers and other ships accounted for one-fifth of the oil spilled, with inadequate equipment and negligent operation a major cause, as well as inadequate regulation by nations which allow ships to fly their flags of convenience. Inadequate facilities at refineries contribute another three hundred thousand tons of oil pollution. A lack of pollution control laws also aggravates the problem. Following a spill in Cape Cod's Buzzard Bay, a team of scientists using the most modern methods of chemical analysis and biological observation, concluded that crude oils were poisons to all marine organisms, and many crude oil distillates are even more poisonous due to higher proportions of toxic compounds. The Water Quality Improvement Act, administered by the Environmental Protection Agency, has given the government new tools to prevent and control oil pollution, but there are continuing problems of oil lumps at sea, spills from offshore oil drilling, and destruction of wildlife. (Ritchie-Florida)
W74-09315

MERCURY LEVELS IN FISH FROM SELECTED WISCONSIN WATERS (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison. Bureau of Research.
For primary bibliographic entry see Field 5A.
W74-09371

THE COOPER RIVER ENVIRONMENTAL STUDY.
For primary bibliographic entry see Field 2L.
W74-09379

STANDING CROPS OF AQUATIC ORGANISMS IN TIDAL STREAMS OF THE LOWER COOPER RIVER SYSTEM, SOUTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 2L.
W74-09380

VERTICAL DISTRIBUTION OF EPIPHYTIC ALGAE ON SPARTINA ALTERNIFLORA FROM TRANSECTS ALONG THE COOPER AND WANDO RIVERS,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 2L.
W74-09381

REPORT ON 'IN SITU' BENTHIC RESPIRATION AND VERTICAL OXYGEN: TEMPERATURE PROFILES.
In: Cooper River Environmental Study: South Carolina Water Resources State Water Plan Report No 117, p 52-61, April 1974. 1 fig, 12 tab.

Descriptors: *Dissolved oxygen, *Estuaries, *Respiration, *South Carolina, *Oxygen demand, Water pollution, Water pollution effects, Water temperature, Reaeration, Mixing.
Identifiers: *Cooper River(SC).

Benthic respiration data were collected at pre-established stations on the Cooper River, South Carolina. A chamber was placed on the river bottom at each of eight pre-established, permanent, stations on the Cooper River. The eight stations were divided into two groups of four, and the dissolved oxygen within the chambers determined on alternate days. A zero, or initial reading, was taken in the morning; another reading was taken five hours later, and then again after 48 hours. Oxygen consumption is rapid during the initial five hours followed by a stabilization of the oxygen uptake during the balance of the 48 hour periods. This indicates a metabolic stabilization. The Cooper River is well oxygenated from surface to bottom. (See also W74-09379) (Knapp-USGS)
W74-09384

TOXICITY OF SODIUM NITRILOTRIACETATE (NTA) TO THE FATHEAD MINNOW AND AN AMPHIPOD IN SOFT WATER,
National Water Quality Lab., Duluth, Minn.
J. W. Arthur, A. E. Lemke, V. R. Mattson, and B. J. Halligan.
Water Research, Vol 8, p 187-193, March 1974. 7 tab, 11 ref.

Descriptors: *Nitrilotriacetic acid, *Toxicity, *Bioassay, *Amphipoda, Minnows, Water pollution effects, Lethal limit, Sodium compounds.
Identifiers: NTA toxicity, *Fathead minnows, *Gammarus pseudolimnaeus.

Amphipods, Gammarus pseudolimnaeus Bousfield and fathead minnows, Pimephales promelas Rafinesque, were submitted to acute (96-h) and chronic (generation-cycle) bioassays with sodium nitrilotriacetic acid (NTA). All measurements are reported as Na3NTA. The average 96-h TL50 values under flow-through conditions were 98 mg/liter NTA for the amphipod and 114 mg/liter for the fathead minnow. The acute toxicity of NTA was caused in part by the high pH resulting from the addition of large amounts of NTA (greater than 100 mg/liter) to soft water. Controlling pH reduced the lethality of NTA by at least one-half to fathead minnow larvae. The chronic no-effect level of NTA to the amphipods was 19 mg/liter; in fathead minnows, it exceeded the highest exposure level (greater than 54 mg/liter). (EPA)
W74-09432

PHOSPHORUS STUDIES IN LOWER GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Madison. Dept. of Water Chemistry.
N. Sridharan, and G. F. Lee.
Journal Water Pollution Control Federation, Vol 46, No 4, p 684-696, April 1974. 9 fig, 7 tab, 16 ref.

Descriptors: *Phosphorus compounds, *Sediments, *Water pollution, *Lake Michigan, Pollutants, Water pollution sources, *Wisconsin, Industrial wastes, Municipal wastes, Water quality, Biochemical oxygen demand, Turbidity, Lakes, Great Lakes, Limnology, Water analysis, Water pollution control, Rivers, Bays, Bottom sediments, Iron, Waste water(Pollution).
Identifiers: *Green Bay(Wisc), Fox River(Wisc).

Chemical analysis of Lake Michigan sediments suggested the presence of phosphorus in association with iron, and laboratory leaching experiments showed significant phosphorus release from Green Bay sediments under both aerobic and anaerobic conditions. The phosphorus budget for the Fox River, the major source of phosphorus in lower Green Bay, indicated that 60% of the total input came from municipal and industrial waste waters. By reducing the phosphorus concentrations in these waste waters by 80% (as a result of the Environmental Protection Agency-State of Wisconsin agreement) the total phosphorus input decreased by 50% in the Fox River water, and by 40% in the Bay as a whole. Because the water quality problems of lower Green Bay also include high BOD and turbidity, the removal of 80% of phosphorus from the waste water discharged in the tributaries of southern Green Bay produced little improvement of water quality in the southern part of the Bay. The removal of 80% of the phosphorus from the waste water sources is justified on the basis of protection of Lake Michigan from further water quality deterioration. (Witt-IPC)
W74-09435

AQUATIC MIDGE LARVICIDES, THEIR EFFICACY AND RESIDUES IN WATER, SOIL, AND FISH IN A WARM-WATER LAKE,
California Univ., Riverside. Dept. of Entomology.
For primary bibliographic entry see Field 5G.
W74-09443

EFFECTS OF A NATURAL FISH KILL ON THE WATER QUALITY, PLANKTON, AND FISH POPULATION OF A POND IN THE BIG CYPRESS SWAMP, FLORIDA,
Miami Univ., Coral Gables, Fla. Dept. of Biology.
J. A. Kushlan.
Transactions of the American Fisheries Society, Vol 103, No 2, p 235-243, April 1974. 3 fig, 4 tab, 18 ref.

Descriptors: Runoff, *Fishkill, *Dry seasons, *Water quality, *Water level fluctuations, *Plankton, *Swamps, Ponds, *Florida, Water levels, Low water mark, Oxygen, Aquatic microorganisms, Aquatic animals, Limnology, Surface waters, Water types, Aquatic life, Dissolved oxygen.
Identifiers: Big Cypress Swamp(Fla).

A naturally occurring fish kill took place during the southern Florida dry season of 1970 when receding water levels forced aquatic organisms out of shallow swamps and into a small pond. Physicochemical parameters of water quality varied greatly from their usual range, as did the abundance of phytoplankton which reached a peak of 2,500,000,000 cells/liter. The fish kill had no effect on the long-term limnological characteristics of the pond, as water quality returned to normal range within 2 months and phytoplankton disappeared within 1 month after the fish kill. The species of fish in the pond showed a range of susceptibility to low oxygen concentration and other aspects of the fish kill. They were classified into three categories based upon their survival: Notemigonus crysoleucas, Lucania goodei, and all centrarchids were eliminated rapidly; Fundulus chrysotus, Peocilia latipinna, Heterandria formosa, and Ictalurus natalis were either eliminated late in the fish kill or survived in numbers lower than measurable by methods used in this study; and Lepisosteus platyrhincus, Gambusia affinis, Jordanella floridae, and the prawn Palaemonetes paludosus survived the fish kill in moderate densities of 0.6 to 6 individuals/sq m. In three species of Lepomis, larger fish died before smaller ones. Six of 22 species of fish and only 0.6% of the previous fish population survived the fish kill. (Witt-IPC)
W74-09448

ON SPENT OF LIQUOR SEMICHEMICAL PULPING. PART III. TOXICITY CHARACTERISTICS OF SCP SPENT LIQUOR AND REDUCTION OF THE TOXICITY (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood chemistry Lab.
R. Kondo, K. Sameshima, and T. Kondo.
Japan Tappi, Vol 27, No 10, p 476-485, Oct, 1973. 5 fig, 12 tab, 22 ref. English summary.

Descriptors: *Toxicity, *Pulp wastes, *Sulfite liquors, Fish, *Sulfur compounds, Hydrogen sulfide, Suspended solids, Lignins, Carbohydrates, Aeration, Irradiation, Ultraviolet radiation, Resistance, Duration curves, Time, Volatility, Water pollution effects.
Identifiers: Mercaptans, Methyl mercaptan(Methanethiol), Kraft mills, Black liquors, Spent pulping liquors, Neutral sulfite semichemical(NSSC) pulping, Spent sulfite liquors, Xylose, Monosaccharides, *Aplocheilus latipes, *Oryzias latipes.

The median tolerance limits (TLm) and the median survival times (MST) of two fish species (Aplocheilus latipes and Oryzias latipes) after 24 and 48 hr exposures to spent neutral sulfite semichemical (NSSC) pulping liquors were measured as toxicity indicators in comparison to kraft pulp effluents. The 48-hr TLm (in terms of COD) was 2340 ppm for neutralized spent NSSC liquor, compared to 755 ppm for kraft mill wastes, indicating a much lower toxicity for the NSSC effluent. However, this toxicity did not decrease appreciably over a period of several days, whereas that of the kraft effluent decreased daily, probably due to the volatilization of methyl mercaptan and hydrogen sulfide. Neither eaeration nor ultraviolet irradiation decreased the toxicity of the spent NSSC liquor, whereas kraft liquor responded well to such treatments. The difference is attributed to interference of suspended solids with these treatments upon prolonged storage. The stable toxicity of the NSSC liquor is thought to come partly from xylose in the suspended matter. (Brown-IPC)
W74-09454

A BENTHOS SURVEY (1972) IN THE NORTH SASKATCHEWAN RIVER IN THE VICINITY OF THE PRINCE ALBERT PULP COMPANY, PRINCE ALBERT, SASKATCHEWAN,
Department of the Environment, Winnipeg (Manitoba). Fisheries and Marine Service.
L. A. Gregory, and J. S. Loch.
Technical Report Series No. CEN T-73-2, March, 1973, 24 p. 2 fig, 5 tab, 9 ref.

Descriptors: *Water pollution effects, *Pulp wastes, *Water pollution sources, Rivers, *Benthic fauna, Effluents, Waste water(Pollution), Fibers(Plant), Solid wastes, Canada, Discharge(Water), Aquatic environment, Organic loading, Waste water treatment, Treatment facilities.
Identifiers: *Saskatchewan River(Canada), Prince Albert Pulp Co.(Prince Albert, Saskatchewan).

The benthic community in the North Saskatchewan River in the vicinity of a bleached kraft pulp mill was surveyed during August 1972. Substrate analyses showed little organic content and suggested that the mill's primary and secondary effluent treatment processes are effectively removing most of the residual wood fibers. The sand-clay substrate restricted the number of representative benthic general present. Qualitative assessments based on chironomids indicated that some pollution effects existed below the mill's outfall, but the presence of pollutant-sensitive Ephemeroptera, Odonata, and Trichoptera throughout the river stretch examined supported the conclusion that no severe pollution problems are posed by the pulp mill operation. (Witt-IPC)
W74-09459

BENTHOS STUDIES (1971 AND 1972) ON THE WINNIPEG RIVER IN THE VICINITY OF THE ABITIBI MANITOBA PAPER COMPANY, PINE FALLS, MANITOBA,
Department of the Environment, Winnipeg (Manitoba). Fisheries and Marine Service.
L. A. Gregory, and J. S. Loch.
Technical Report No CEN T-73-3, June, 1973, 37 p. 5 fig, 6 tab, 14 ref.

Descriptors: *Water pollution sources, *Water pollution effects, Fibers(Plant), *Pulp wastes, Rivers, *Benthic fauna, *Canada, Effluents, Industrial wastes, Discharge(Water), Waste water(Pollution), Fish hatcheries, Fish, Fish behavior, Aquatic environment, Liquid wastes, Solid wastes, Wood wastes, Toxicity.
Identifiers: *Winnepeg River(Canada), Abitibi Manitoba Paper Co.(Pine Falls, Manitoba), Log booms, Sublethal effects.

Benthic surveys were conducted in the summers of 1971 and 1972 to assess the condition of the Winnipeg River in the neighborhood of Abitibi Manitoba Paper Co.'s integrated newsprint mill. Qualitative and quantitative analyses of the collected data (including diversity indices for aquatic genera) indicated that the benthic community is moderately to severely affected in the vicinity of the mill's effluent outfall, and that heavy to moderate pollution effects extend up to 4 miles downstream. The mill's discharge consists of both liquid and solid wastes (wood fibers), the latter originating also from the log boom. Fiber deposits have been shown in earlier studies to affect the hatching of fish eggs and the survival of fry. Removal of this fiber source would benefit the aquatic community. (Witt-IPC)
W74-09460

THE EFFECTS OF WATER FLOW MANIPULATION BELOW THE HYDROELECTRIC POWER

DAM ON THE BOTTOM FAUNA OF THE UPPER KENNEBEC RIVER, MAINE,
Maine Cooperative Fishery Unit, Orono.
H. M. Trotzky, and R. W. Gregory.
Transactions of the American Fisheries Society, Vol 103, No 2, p 318-324, April, 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Water level fluctuations, *River flow, *Maine, *Benthic fauna, *Aquatic life, Aquatic insects, Hydroelectric plants, Fluctuations, Impounded waters, Rivers, Water sampling, Dams, Streamflow, Discharge(Water), Hydraulic structures, Engineering structures.
Identifiers: *Kennebec River(Maine), Wyman Dam(Maine).

The effect of severe fluctuations in water flow on the distribution of bottom fauna of the upper Kennebec River was studied. During the years 1964-1970, discharge below Wyman Dam ranged from 8.5 cu m/sec to an average daily high of about 170 cu m/sec. Slow currents resulting from low flows appeared to limit the diversity and abundance of swift-water aquatic insects on the river bottom below the dam. Sampling stations above the impoundment averaged 19 aquatic insect genera, while those below the dam averaged 11. About 19 genera were found at stations where the current near bottom fluctuated from 0.5 m/sec to 0.9 m/sec, while only 4 genera were found at stations where the fluctuations were from 0.1 to 0.5 m/sec. Aquatic insects adapted for swift water, such as Rhyacophila, Chimarra, Iron, Blepharocera, Acroneuria, and Paragnetina, were more abundant above the impoundment than below, and were absent from those stations below the impoundment with the lowest current velocities. (Witt-IPC)
W74-09462

BIOLOGICAL MONITORING OF THE FRASER RIVER NEAR PRINCE GEORGE, B.C.,
Beak (T.W.) Consultants Ltd., Toronto (Ontario).
D. Stone, T. C. Griffing, and M. C. Knight.
Pulp and Paper Magazine of Canada, Vol 75, No C (Convention issue), p 100-106 (Technical Paper T110), March, 1974. 7 fig, 19 ref.

Descriptors: Rivers, *Monitoring, *Fish, *Surveys, *Effluents, Aquatic life, *Canada, Aquatic environment, Water pollution, Water pollution effects, Waste water treatment, Pulp and paper industry, Pulp wastes, Industrial wastes, Water pollution sources, Water analysis, Analytical techniques, Biota, Biological treatment.
Identifiers: Water biology, *Fraser River(B.C.-Canada).

A biological survey was made of the Fraser River near Prince George, British Columbia, before and after startup of 3 kraft pulp and paper mills, for the purpose of determining the possible effects of mill effluent on the biological conditons of the river. The objectives were to document pre-operational baseline conditons and to detect and measure possible mill-induced changes so that corrective measures could be taken if necessary. Biological surveys were conducted twice in 1963, four times in 1964, and annually thereafter through 1970. The original study was sponsored by Prince George Pulp and Paper Company and was joined later by Northwood Pulp Company and by Intercontinental Pulp Company. The survey program is described and salient features of the data, methods of analysis, and conclusions are presented. The general good condition of the river after receiving effluent discharges indicates that the waste treatment systems at the mills are functioning satisfactorily. (Buchanan-IPC)
W74-09463

THE ENVIRONMENTAL IMPACT CONCEPT, AND ITS EFFECT ON THE NATIONAL GAS INDUSTRY,
Southwest Research Inst., San Antonio, Tex.
A. R. Schleicher.
American Gas Association Monthly, Vol 56, No 4, p 21-25, April, 1974.

Descriptors: *Environmental effects, *Natural gas, Evaluations, Federal government, Environmental control.
Identifiers: *Environmental impact statements, *Natural gas industry.

The environmental impact concept and its effect on the natural gas industry are discussed. Organizations are required to evaluate anticipated environmental effects of their actions and decision making processes. A draft of the evaluation must be circulated 90 days prior to the action, and a final statement is due at the Environmental Protection Agency 30 days before the action is scheduled. Practically all sectors of the gas industry are being effected by the new requirements. Producers may encounter federal requirements for environmental reports when operations involve federal or Indian lands, or offshore locations. Segments of the industry involved in gas transmission are acutely aware of the influence of environmental questions, since most of their construction activities involve federal authorization. Most companies involved in the environmental impact process find it necessary to seek the aid of outside consultants. But, decision makers in the natural gas industry should develop their own practical appreciation of the scope and intent of current environmental policies and the way the system works. (Merritt-FIRL)
W74-09489

CADMIUM TOXICITY AND BIOCENTRATION IN LARGEMOUTH BASS AND BLUEGILL,
Oklahoma Univ. Health Sciences Center, Oklahoma City. Dept. of Environmental Health.
J. E. Cearley, and R. L. Coleman.
Bulletin of Environmental Contamination and Toxicology, Vol 11, No 2, p 146-151, 1974. 4 fig, 7 ref.

Descriptors: *Cadmium, *Bass, *Sunfishes, Animal behavior, Animal growth, Growth rates, Environmental effects, Animal diseases, Investigations, Evaluations, *Water pollution effects, Water analysis, *Toxicity.
Identifiers: Accumulation, Nervous system, Exposure.

The effects of subacute exposure to cadmium in the largemouth bass and bluegill were evaluated based on observations of behavioral effects, rate of growth, survival, and tissue and organ accumulation of cadmium. Exposure to cadmium in concentrations ranging from 0.0005 to 0.85 mg/liter resulted in accumulation of the metal in concentrations greater than those of the water. The quantity of metal accumulated increased as the exposure concentration increased. An equilibrium developed between the concentrations of the metal in the water and in the tissues after approximately 2 months. Metal accumulations on the bass tissues were higher in the internal organs, followed by the gills and the remainder of the body. The bass were more sensitive to cadmium than the bluegill. Abnormal behavior patterns observed in both species suggested that the nervous system was the site of damage. (Merritt - FIRL)
W74-09492

NUTRIENTS AND AQUATIC VEGETATION EFFECTS,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
G. W. Fuhs.
Journal of the Environmental Engineering Division, American Society of Civil Engineers Vol 100, No EE2, p 269-278, April, 1974. 1 tab, 14 ref.

Descriptors: *Eutrophication, *Ecosystems, *Nutrient removal, *Phosphorus, Aquatic life, Streams, Rivers, Reservoirs, Water pollution sources, Water pollution control, Land use, Surface runoff, Nitrogen, Productivity, Soils.
Identifiers: *Nutrient pollution.

The effect of nutrient pollution and nutrient removal on aquatic ecosystems is discussed. Because the increase in productivity of streams and rivers is difficult to control, measures to control eutrophication of inland lakes and reservoirs must center around control of total phosphorus loadings. To the extent that excessive phosphorus loadings are in part or totally due to discharges from point sources, these sources must be controlled. In many lakes, however, inputs from natural and other nonpoint sources are significant. Such inputs must be determined as a basis for evaluating total control needs with respect to projected best usage and, in consequence, the desirability and feasibility of control of nonpoint sources and land use. It is hoped that continued studies of land runoff will soon provide an overall view of phosphorus runoff from natural sources, so that runoff numbers will be available for most watersheds of New York State and other areas of the United States. The control of eutrophication in coastal waters requires the control of nitrogen discharges. (Merritt - FIRL)
W74-09498

SOME PRACTICAL ASPECTS CONCERNING THE USE OF THE MOLLUSCICIDE N-TRITYLMORPHOLINE (FRESCON) FOR THE CONTROL OF FASCIOLIASIS,
Shell Research Ltd., Sittingbourne (England). Woodstock Agricultural Research Centre.
N. O. Crossland.
Helminthologia (Bratisl). 10. p 83-91. 1969.
Identifiers: Amphibians, Control, *Fasciolahepatica, Fascioliasis, Fish, *Frescon, Leech, *Lymnaea-truncatula, *Molluscicides, Morpholine, Toxicity.

The molluscicide N-tritylmorpholine (Frescon) shows promise for the control of Lymnaea truncatula, snail host of Fasciola hepatica. N-Tritylmorpholine is very effective against L. truncatula when sprayed on pastures in dosages within the range 0.25-0.5 kg/ha. It has no effect on plants and no known biological activity against terrestrial animals of any kind. Various species of aquatic snails, leeches, fish and amphibians may be affected. The molluscicide may be applied with a variety of equipment including knapsack sprayers, tractor-mounted sprayers and aircraft. Provided that the soil is wet and vegetation does not impede penetration to soil level the volume of spray liquid has no influence on effectiveness. The relative merits of spring and autumn applications with N-tritylmorpholine are discussed. Autumn treatment is generally aimed at preventing losses due to outbreaks of acute fascioliasis and depends on a system of forecasting outbreaks of outbreaks of disease. Routine spring treatment of snail habitats may be preferred to limit the prevalence of chronic liasis. N-Tritylmorpholine should be applied when the soil is wet and likely to remain so. Penetration is best achieved when the grass is short. Such conditions predictably occur in the spring but may also occur in the autumn, especially following wet summers.--Copyright 1973, Biological Abstracts, Inc.
W74-09525

BACTERIOLOGICAL WATER QUALITY AND INCIDENCE OF WATERBORNE DISEASES IN A RURAL POPULATION,
S. N. Medical Coll., Agra (India).
B. K. Trivedi, H. S. Gandhi, and N. K. Shukla.
Indian J Med Sci, 25(11): 795-801, 1971.
Identifiers: *Bacteriological studies, Chlorination, Dysentery, Enteritis, Human diseases, *India(Kanpur), Rural populations, *Water quality, *Water-Borne diseases, *Water wells.

The incidence of waterborne diseases in 48 wells in 3 villages in Kanpur (India) was reported. The relationship between the bacteriological quality of drinking water and the effect of chlorination was

observed. Chlorination with 0.5 ppm of residual chlorine was best in reducing bacteriological contents of well water. Of 162 human cases of waterborne diseases, the majority were of gastroenteritis followed by dysentery. The incidence of waterborne diseases was compared for the control group and those served by the experimental wells. Chlorination reduced the incidence of waterborne diseases in the experimental wells when compared to the same period in previous yr.--Copyright 1973, Biological Abstracts, Inc.
W74-09540

HEALTH EFFECTS OF ENVIRONMENTAL POLLUTANTS,
G. L. Waldbott.
C. V. Mosby Company, Saint Louis, Missouri. 1973. 316 p.

Descriptors: *Air pollution effects, *Diseases, *Pollutants, *Public health, Air pollution, Human diseases.
Identifiers: *Environmental pollutants, *Health effects.

The health effects of air-born pollutants are examined, and they are classified according to their specific effect on the human body. Much of the data used in making these correlations has been obtained from animal experiments and occupational exposures to high concentrations. Part I considers the sources and action of the various pollutants, and the body's defenses against the pollutants. Part II considers the specific health effects of the various pollutants and classifies them into the following agents: (1) fibrosis-producing agents, (2) granuloma-producing agents, (3) fever-producing agents, (4) asphyxiating pollutants, (5) systemic poisons, (6) allergenic agents, (7) carcinogens, and (8) mutagenic pollutants. Part III, entitled Special Situations, considers the effects of economic poisons, hydrocarbons, radioactive substances, smoking, water pollution, and fires. Part III also contains a chapter dealing with the prophylaxis and treatment of diseases caused by air pollution. (Martino-NWWA)
W74-09547

MERCURY AND OTHER METALS IN BRITISH SEALS,
Institute for Marine Environmental Research, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 5B.
W74-09571

NORTHWEST FISHERY CENTER RESEARCH ON EFFECTS OF ENVIRONMENTAL CONTAMINANTS ON MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center. Environmental Conservation Division.
M. E. Stansby, and D. L. Alverson.
Marine Fisheries Review, Vol 35, Nos 5-6, p 8-14, 1973. 7 photos.

Descriptors: *Research and development, *Contaminants, *Marine fish, *Water pollution effects, Analytical techniques, Marine plants, Industrial wastes, Oil, Heavy metals, Pesticides.

Associated with many previous investigations by other researchers has been the erroneous overt or inadvertent implication that when the amounts of contaminants in fish (such as DDT and mercury) exceed the level deemed safe for human consumption, the contaminants must be doing harmful things to the animals themselves. The aim of the program at the Northwest Fishery Center is to assess the physiological or biochemical damage resulting from different levels of contaminants which may be incorporated through various mechanisms into marine organisms. New studies initiated at the NWFC will employ contaminants presented to fish in their feed at levels comparable to those encountered by fish in their natural environment. The contaminants to be studied will include the pesticide endosulfan, PCB's, and petroleum oil components. The investigation into the effects of contaminants upon fish will involve a three-pronged attack: (1) biochemical investigations looking into pathways within the fish of contaminants, (2) physiological studies aimed at determining the effects of environmental alterations and contaminants on marine and anadromous species, (3) field research operations which conduct practical tests in the natural environment based upon laboratory findings. (Jernigan-Vanderbilt)
W74-09572

A SURVEY OF TRACE METALS IN HUMAN HAIR,
Lamar Univ., Beaumont, Tex. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-09573

MERCURY IN TUNAS: A REVIEW,
Inter-American Tropical Tuna Commission, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W74-09574

EXCRETION AND ABSORPTION OF METHYL MERCURY AFTER POLYTHIOL RESIN TREATMENT,
Rochester Univ. Medical Center, N.Y. Dept. of Radiation Biology and Biophysics.
T. W. Clarkson, H. Small, and T. Norseth.
Archives of Environmental Health, Vol 26, No 4, p 173-176, April 1973. 2 fig, 1 tab, 12 ref.

Descriptors: *Mercury, *Laboratory tests, *Rodents, Movement, Toxins, Inorganic compounds, Laboratory animals, Foods, Testing procedures, Public health, *Absorption.
Identifiers: *Methyl mercury.

Results are reported of feeding to mice a polystyrene resin containing fixed sulfhydryl groups. Test involved the effects of the resin on the rate of excretion of methyl mercury and also on the gastrointestinal absorption of methyl mercury compounds in food. A synthetic polythiol resin when added to food at a concentration of 1% doubled the rate of excretion of mercury from mice given a simple dose of methyl mercuric chloride. After 42 days of resin treatment the levels of mercury in blood, brain, kidney, and liver had been reduced by factors of 7.2, 6.0, 7.2, and 10.0, respectively, as compared with those in untreated animals. The resin also reduced by 50% the rate of absorption of methyl mercury compounds from food. (Jernigan-Vanderbilt)
W74-09575

BONE CHANGES IN EXPERIMENTAL CHRONIC CADMIUM POISONING, RADIOLOGICAL AND BIOLOGICAL APPROACHES,
Kyoto Univ., (Japan). Dept. of Hygiene.
Y. Itokawa, T. Abe, and S. Tanka.
Archives of Environmental Health, Vol 26, p 241-244, May 1973. 3 fig, 3 tab, 9 ref.

Descriptors: *Cadmium, *Laboratory tests, *Rodents, Industrial wastes, Laboratory animals, Human diseases, Public health, Toxicity, Diets, Growth rates.
Identifiers: Calcium deficiency, Bone damage.

The following experiments were undertaken to test the hypothesis that calcium deficiency coupled with cadmium poisoning is responsible for Itai Itai disease. To clarify the relationship between chronic cadmium poisoning and bone abnormalities, male Wistar rats were separated into eight groups given eight different synthetic diets. After four weeks of these dietary regimens the rats were killed and examined roentgenographically. Muscles and bones were removed and analyzed for cadmium, calcium, magnesium, and zinc. The most remarkable x-ray finding was the abnormal curvature of the spinal column. Cervicodorsal lordosis and dorsolumbar kyphosis as well as scoliosis increased markedly in rats fed a low-protein, calcium-deficient, and cadmium-added diet. Cadmium levels increased and magnesium and zinc levels decreased in bones of cadmium-dosed groups. Calcium levels in red muscle (soleus) and white muscle (gastrocnemius) were significantly elevated in rats on a low-protein, calcium-deficient, and cadmium-added diet. (Jernigan-Vanderbilt)
W74-09576

BRAIN ALUMINUM DISTRIBUTION IN ALZHEIMER'S DISEASE AND EXPERIMENTAL NEUROFIBRILLARY DEGENERATION,
Toronto Univ. (Ontario). Dept. of Physiology.
D. R. Crapper, S. S. Krishnan, and A. J. Dalton.
Science, Vol 180, p 511-513, May 1973. 1 tab, 8 ref.

Descriptors: *Aluminum, *Human pathology, *Animal pathology, Human diseases, *Toxicity, Public health, Laboratory animals, Laboratory tests, Analytical techniques, Spectroscopy, Industrial wastes.
Identifiers: *Alzheimer's disease, *Felines.

In the early stages of an aluminum chloride-induced encephalopathy in cats, an apparently selective impairment in short-term memory and associative learning preceded the appearance of focal neurological signs. The decline in higher nervous functions resembled in part those noted in the human conditions of presenile and senile demention of the Alzheimer type. A study of the aluminum concentration in the brain of cats with acquisition defects was undertaken in order to establish the tissue concentration at which morphological and behavioral changes occurred. In addition, the aluminum content of the brain was determined in humans with Alzheimer's disease. The variation in aluminum concentration in cortical regions is noteworth in relation to the characteristic pathological finding in Alzheimer's disease of the patchy distribution of neurofibrillary degeneration (NFD). The density of NFD in the experimental model is often very much higher than that encountered in Alzheimer's disease. Nevertheless, the surprisingly high tissue concentration of 9 to 11 micrograms/g in some regions of brain in Alzheimer's disease, compared to the average values of 14 micrograms/g in cat brain with experimental NFD, suggests that aluminum may be a neurotoxic factor in the human disease. (Jernigan-Vanderbilt)
W74-09579

HEAVY METAL ESTIMATION IN BIOLOGICAL SYSTEMS,
Bristol Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 5B.
W74-09580

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-09592

CHANGES IN OXYGEN AND PRIMARY PRODUCTION OF THE PATUXENT ESTUARY, MARYLAND, 1963 THROUGH 1969,
Geological Survey, Edgewater, Md.
For primary bibliographic entry see Field 5B.
W74-09624

LIMNOLOGICAL STUDIES OF LAKE JACOMO, JACKSON COUNTY, MISSOURI. II. THE DYNAMICS OF THE MACROBENTHOS AND ITS RELATIONSHIP TO WATER QUALITY AND PLANKTON DISTRIBUTION IN

LAKES JACOMO AND PRAIRIE LEE, WITH A NOTE ON THE SPORT FISHERY, 1971-1972,
Missouri Univ., Kansas City. Dept. of Biology.
M. S. Stern, and D. H. Stern.
Available from the National Technical Information Service as PB-233 691, $4.00 in paper copy, $1.45 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, June 1974. 75 p, 22 fig, 7 tab, 29 ref. OWRR A-052-MO(1). 14-31-0001-3525.

Descriptors: *Benthos, Aquatic insects, Algae, *Plankton, *Water quality, Recreation, *Eutrophication, Sport fishery, *Missouri, Lakes, Nutrients, *Mollusks, *Cyanophyta, Sunfishes, Phosphates, *Diptera.
Identifiers: *Lake Jacomo(Mo), Nitrate nitrogen, Prairie Lee Lake(Mo), Aphanizomenon flos-aquae, Musculium truncatum.

The macrobenthos and its relationship to the plankton and water quality were studied for a year in two adjacent recreational reservoirs, Lakes Jacomo and Prairie Lee. These primary recreational waters for metropolitan Kansas City, with more than 2 million visits annually, have been culturally eutrophicated. Both lake shorelines are dissected, and the watershed and privately owned shoreline areas of Prairie Lee Lake provide nutrients that promote nuisance Cyanophyta blooms in both lakes. Nitrate nitrogen mean concentrations ranged from 0.05-0.50 ppm, while those for orthophosphate ranged from 0.04-0.24 ppm. There were 74 macrobenthic and 151 plankton taxa collected. Insects, primarily Diptera, dominated the macrobenthos in Lake Jacomo, while molluscs were dominant in Prairie Lee Lake. The maximum standing crops were 1952/sq. ft. in Lake Jacomo in October and 4256/sq. ft. in Prairie Lee Lake in December. Diptera comprised 59% of the total macrobenthos in Lake Jacomo, while molluscs, mostly Musculium truncatum, made up 76% of it in Prairie Lee Lake. Cyanophyta, particularly Aphanizomenon flos-aquae, dominated the plankton for the second successive year. The sport fishery in Lake Jacomo has been decreasingly dominated by bluegill. The mean catch per angler over a five-year period was 1.5 fishes, and the mean catch per hour was 0.58 fish. (See also W72-10431)
W74-09660

55FE CONCENTRATION AND SPECIFIC ACTIVITIES IN NORTH PACIFIC MARINE ORGANISMS,
Battelle-Pacific Northwest Lab., Richland, Wash.
C. E. Jenkins, and J. C. Langford.
IEEE Transactions on Nuclear Science, Vol NS-21, No 1, p 517-521, February, 1974. 8 fig, 16 ref.

Descriptors: Iron, *Salmon, Marine fish, Sea water, *Pacific Ocean, *Alaska, Food chains, *Radionuclides, Investigations, Aquatic environment, Environmental effects.
Identifiers: *Iron-55.

Marine organisms have been shown to have up to 1000-fold higher specific activities of iron-55 than that in seawater; also iron-55 specific activities increase 10 to 30-fold in salmon between mid and northern latitudes. These observations are currently explained on the basis of a different chemical form for iron-55 in seawater and greater dilution of the iron-55 by stable iron at mid-latitudes than at the northern latitudes. The half-time for iron-55 concentrations in mature harvested salmon at all latitudes is approximately 10 months, which is comparable to the half-time for movement of stratospheric debris to the earth's surface. (Sandoski-FIRL)
W74-09733

CADMIUM UPTAKE BY WHEAT FROM SEWAGE SLUDGE USED AS A PLANT NUTRIENT SOURCE, A COMPARATIVE STUDY USING FLAMELESS ATOMIC ABSORPTION AND NEUTRON ACTIVATION ANALYSIS,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Linnman, A. Andersson, K. O. Nilsson, B. Lind, and T. Kjellstrom.
Archives of Environmental Health, Vol 27, No 1, p 45-47, July 1973. 1 fig, 4 tab, 7 ref.

Descriptors: *Cadmium, *Sewage sludge, *Environmental sanitation, *Crop production, *Wheat, Industrial wastes, Analytical techniques, Testing procedures, Effluents, Nutrients, Sludge disposal, *Neutron activation analysis, Spectroscopy, Pollutant identification.

Wheat has been grown in tests pots at four different sewage sludge concentrations and three different pH levels in order to study the cadmium uptake from sewage sludge. The sludge contained 10 parts per million (ppm) cadmium, which is below the average cadmium concentration in sludge from Swedish sewage sludge plants. The analysis of cadmium in wheat has been performed by two methods, atomic absorption and neutron activation analysis, and good agreement was found between results from the methods. The results show that the cadmium uptake increases strongly with increasing sewage sludge concentrations. It can be concluded beyond any doubt that cadmium from sewage sludge used as a plant nutrient source is resorbed by plants. The pH of the soils was found to be of great importance for the uptake of cadmium. Lower pH gave greater cadmium uptake. (Jernigan-Vanderbilt)
W74-09758

MERCURY IN HUMAN HAIR, A STUDY OF THE RESIDENTS OF LOS ALAMOS, NM, AND PASADENA, CALIF., BY COLD VAPOR ATOMIC ABSORPTION SPECROPHOTOMETRY,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 5A.
W74-09759

INTERFERENCES IN THE DETERMINATION OF METALLIC ELEMENTS IN HUMAN HAIR, AN EVALUATION OF ZINC, COPPER, LEAD AND CADMIUM USING ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 5A.
W74-09760

LEAD AND VITAMIN EFFECTS ON HEME SYNTHESIS,
Illinois University, Urbana. Dept. of Animal Science.
R. L. C. Kao, and R. M. Forbes.
Archives of Environmental Health, Vol 27, No 1, p 31-35, July 1973. 2 fig, 5 tab, 54 ref.

Descriptors: *Lead, *Vitamins, *Toxicity, *Rodents, Laboratory tests, Laboratory animals, Testing procedures, Heavy metals, Animal metabolism.
Identifiers: Vitamin B12, Ascorbic acid, *Heme synthesis.

When a purified diet was supplemented with 300 ppm lead as the acetate and was fed to weanling rats, significant decreases in feed intake, weight gain, and blood heme were observed. In vitro heme synthesis in blood from these lead-treated animals was increased by a single injection of niacin or vitamins C + B12; pyridoxine, thiamine, or riboflavin had no effect. Exposure to diet lead concentrations of 50, 150, and 300 ppm produced a significant and graded increase of urinary delta-aminolevulinic acid (ALA) within 18 hours, followed by a gradual decrease. A tenfold dietary excess of niacin provided no significant protection against toxic reactions from lead in terms of in vivo blood heme levels, in vitro heme synthesis, or urinary ALA. (Jernigan-Vanderbilt)
W74-09761

LEAD CONCENTRATION FOUND IN HUMAN BLOOD IN ASSOCIATION WITH LEAD COLIC,
Yugoslav Academy of Sciences and Arts, Zabreb. Inst. for Medical Research.
T. Beritic.
Archives of Environmental Health, Vol 23, No 4, p 289-291, October 1971. 1 tab, 1 ref.

Descriptors: Lead, *Human pathology, *Analytical techniques, Industrial wastes, Absorption, Toxicity.
Identifiers: *Lead colic, *Yugoslavia.

Results are discussed of a study of 64 patients suffering with lead intoxication. The diagnosis of lead colic was based upon the existence of severe attacks of spasmodic abdominal pain preceded, accompanied, or followed, invariably, by obstinate constipation. In some of the most severe cases of lead poisoning the levels of concentration of lead in the blood were found to be remarkedly low. Blood was drawn from all subjects for lead analysis before any therapeutic measures were undertaken, and the specimens analyzed in parallel by a modification of the dithizone method. Specimens analyzed by this method are deemed to be abnormal when the concentration of lead is in excess of 70 micrograms/100 ml. For 13 of the 64 patients, levels ranged from somewhat less than 40 micrograms/100 ml to just 80 micrograms/100 ml. It is concluded that the finding of a low level of lead content in the blood, of itself, is not always a proper basis for the diagnostic exclusion of lead intoxication. (Jernigan-Vanderbilt)
W74-09764

REDUCTION IN MERCURY CONTENT OF FISH PROTEIN CONCENTRATE BY ENZYMATIC DIGESTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
M. C. Archer, B. R. Stillings, S. R. Tannenbaum, and D. I. C. Wang.
Agricultural and Food Chemistry, Vol 21, No 6, p 1116, November/December 1973. 1 tab, 10 ref.

Descriptors: *Mercury, *Fish, *Proteins, *Enzymes, Laboratory tests, Analytical techniques, Spectroscopy, Food processing industry, Heavy metals.
Identifiers: *Enzymatic digestion, Proteolysis.

During the processing of fish into FPC (fish protein concentrate) by isopropyl alcohol extraction, the protein is concentrated by a factor of 4-6, with a corresponding fivefold enhancement of mercury concentration. This indicates that little or no mercury is extracted from fish during concentrate manufacture. The amount of mercury can be reduced in FPC by proteolytic digestion. A two- to sevenfold concentration of mercury in the insoluble FPC fraction and corresponding reduction in mercury level in the soluble FPC fraction was achieved after proteolysis. In 1 hr roughly 90% of the mercury remained in the insoluble fraction whereas only 10% was in the soluble product; after 6 hr, roughly 80% of the mercury was found in the insoluble fraction and 20% in the soluble product. The concentrations of mercury in the enzyme-resistant fraction may mean that either the mercury is bound to an extremely enzyme-resistant fraction or the presence of mercury in the protein lends the property of enzyme resistance. On the basis of these results, the biological availability of Hg is about 20%, assuming that the insoluble fraction passes the gut unabsorbed. (Jernigan-Vanderbilt)
W74-09766

BERYLLIUM-INDUCED ULTRASTRUCTURAL CHANGES IN INTACT AND REGENERATING LIVER,
Pittsburgh Univ., Pa. Dept. of Pathology.
P. J. Goldblatt, M. W. Lieberman, and H. Witschi.

Archives of Environmental Health, Vol 26, p 48-56, January 1973. 12 fig, 1 tab, 44 ref.

Descriptors: *Beryllium, *Laboratory tests, *Laboratory animals, *Human diseases, Toxicity, Public health, Rodents, Animal pathology, Cytological studies, Heavy metals.
Identifiers: Liver necrosis, Cancer, *DNA.

A light and electron microscopic examination of resting and regenerating liver was undertaken to further document the subcellular effects of the Be compounds and provide structural correlates for the growing body of biochemical observations. Intact or partially hepatectomized male rates were given intravenous aqueous BeSO4-4H2O. Light microscope studies of partially hepatectomized animals examined at 6, 12, 24, and 48 hours after injections of 15, 30, or 60 micromals BeSO4 per kilogram or given 30 micromols BeSO4 per kilogram 8, 12, and 22 hours after partial hepatectomy and killed at 28 hours, revealed liver necrosis in animals surviving 48 hours, and abolition of mitoses in animals treated 16 or 20 hours before death. Ultrastructural alterations in both intact and partially hepatectomized animals examined 24 hours following Be injection included vacuolization and dense deposits in lysosomes, loss of fibrils and appearance of dense plaques in some nucleoli, and distoration of bile canaliculi. The lysosomal changes and inhibition of mitosis correlate well with previous biochemical studies. The exact mechanism by which Be induces inhibition of DNA synthesis and hepatic necrosis remains to be elucidated by further studies. (Jernigan-Vanderbilt)
W74-09769

HEAVY ELEMENTS IN SURFACE MATERIALS: DETERMINATION BY ALPHA PARTICLE SCATTERING,
Chicago Univ., Ill. Enrico Fermi Inst.
For primary bibliographic entry see Field 5A.
W74-09770

ISOLATION OF (BETA SUB 2)-MICROGLOBULIN FROM THE URINE OF PATIENTS WITH ITAI-ITAI (OUCH-OUCH) DISEASE,
National Inst. of Industrial Health, Kawasaki (Japan). Dept. of Occupational Diseases.
For primary bibliographic entry see Field 5A.
W74-09771

SIGNIFICANCE OF LEAD ISOTOPE COMPOSITION IN BLOOD,
Texas Univ., Dallas, Inst. for Geological Sciences.
For primary bibliographic entry see Field 5A.
W74-09772

GASTROINTESTINAL ABSORPTION OF DIFFERENT COMPOUNDS OF 115M CADMIUM AND THE EFFECT OF DIFFERENT CONCENTRATIONS IN THE RAT,
National Environmental Research Center, Cincinnati, Ohio. Environmental Toxicology Research Div.
W. Moore, Jr., J. F. Stara, and W. C. Crocker.
Environmental Research, Vol 6, p 159-164, 1973. 2 fig, 2 tab, 9 ref.

Descriptors: *Cadmium, *Toxins, *Laboratory tests, *Rodents, Public health, Laboratory animals, Testing procedures, Distribution patterns, Absorption, Animal metabolism.
Identifiers: Dosage.

The effect, if any, of different chemical compounds of 115m cadmium upon gastrointestinal absorption, retention, and tissue distribution and the effect of different concentrations of cadmium upon absorption were studied in female rats. After a single oral dose, the chloride, sulfate, and acetate forms of 115m Cd did not significantly influence the absorption, retention, or distribution of the 115m Cd in the tissues. The only organs containing significant amounts of 115m Cd were the liver, kidney, and gastrointestinal tract. Increases in concentration of cadmium resulted in more cadmium being absorbed from the gastrointestinal tract, although the amount absorbed was not proportional to the increase in concentration. The results showed that only 3-5% of a given oral dose of the cadmium compounds tested is absorbed with considerable variation among animals. Cadmium absorption was increased considerably by low intake of calcium and protein in animals; it appears that a similar effect would occur in man. (Jernigan-Vanderbilt)
W74-09778

CADMIUM, NICKEL, LEAD, AND ZINC IN EARTHWORMS FROM ROADSIDE SOIL,
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Wildlife Refuges.
C. D. Gish, and R. E. Christensen.
Environmental Science and Technology, Vol 7, No 11, p 1060-1062, November 1973. 2 tab, 16 ref.

Descriptors: *Cadmium, *Lead, *Zinc, *Soil contamination, *Annelids, Nickel, Toxicity, Air pollution, Path of pollutants, Public health, Heavy metals, Measurement.
Identifiers: *Automobile emissions, *Soil organisms.

Cd, Ni, Pb, and Zn in soils and earthworms along two Maryland highways decreased with increasing distance (10, 20, 40, 80, and 160 ft) from the roadway. Metals were quantified by atomic absorption spectrophotometry. Metal residues were higher at the location along each highway where traffic volume was greater. Correlations between residues in earthworms and soil decreased with decreasing atomic weights (Pb > Cd > Zn > Ni). Metal residues in soils were positively correlated with quantities of soil organic matter. Earthworms accumulated up to 331.4 ppm of Pb and 670.0 of Zn, concentrations which may be lethal to earthworm-eating animals. (Jernigan-Vanderbilt)
W74-09780

ZINC AND CADMIUM IN NORMAL HUMAN EMBRYOS AND FETUSES, ANALYSES BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Inst. of Rehabilitation Medicine. Univ. Medical Center, N.Y.
S. Chaube, H. Nishimura, and C. A. Swinyard.
Archives of Environmental Health, Vol 26, No 5, p 237-240, May 1973. 2 tab, 46 ref.

Descriptors: *Cadmium, *Zinc, *Laboratory tests, *Human pathology, *Distribution, Toxicity, Industrial wastes, Spectrophotometry, *Pollutant identification.
Identifiers: Atomic absorption spectroscopy.

Zinc and cadmium concentration in 51 intact normal human embryos and fetal organs derived from abortuses ranging in ages from 31 to 261 days of gestation were determined by atomic absorption spectroscopy. The concentrations of zinc and cadmium were studied with reference to age, sex, and stage of development. Specimens studied were 36 first trimester intact human embryos and liver, brain, and kidney of 14 second and 1 third trimester fetuses. Zinc was found in all first trimester specimens. It increased sevenfold between the 31st and 35th day of gestation. Cadmium was present in 57% of specimens in concentrations from 0.032 micro-g/gm to 0.07 micro-g/gm of wet tissue. In second trimester specimens, mean zinc concentration in the brain was 5.6 micrograms, in kidney 15.7 micrograms, and in the liver 167.7 micrograms. Cadmium was present in 80% of livers (mean, 0.113 micro-g/gm), 28% of kidneys (mean, 0.05 micro-g/gm), and 17% of brain specimens (mean, 0.140 micro-g/gm). Mothers of these abortuses did not live in areas of Japan where endemic cadmium poisoning exists; however, higher cadmium content of the average Japanese diet may be reflected by cadmium concentration in these specimens. (Jernigan-Vanderbilt)
W74-09785

NICKEL CARBONYL POISONING, REPORT OF A FATAL CASE,
Pasadena Bayshore Hospital, Tex.
C. C. Jones.
Archives of Environmental Health, Vol 26, No 5, p 245-248, May 1973. 1 tab, 13 ref.

Descriptors: *Nickel, *Toxicity, *Industrial wastes, *Air pollution effects, Inorganic compounds, Public health, Human pathology, *Lethal limit.

Nickel carbonyl (Ni(CO)4) used as a catalyst in the petroleum, plastic, and rubber industries, is by far the most toxic nickel compound encountered in industry, comparable to hydrogen cyanide gas. The maximum permissible concentration of vapor in air (for 8 hours) is 0.001 ppm. In many cases of accidental poisoning nickel carbonyl was not recognized as the offending agent until several days after exposure. Initial and delayed symptoms are described. Fatalities usually occur between the 4th and 11th days after exposure. Death is usually due to pulmonary and cerebral edema. The urine and the lungs are areas where nickel carbonyl is most easily detected. A fatal case of poisoning is described. In the past, various treatments of nickel carbonyl poisoning with edetic acid, dimercaprol (BAL in oil), penicillamine, and more than 20 alkyl dithiocarbamates have been tried. Of these, diethyldithiocarbamate has proven to be effective as well as the least toxic. It is free of the protracted undesirable side effects of either dimercaprol or penicillamine. (Jernigan-Vanderbilt)
W74-09786

GRANULES CONTAINING LEAD IN ISOLATED MITOCHONDRIA,
John Curtin School of Medical Research, Canberra (Australia). Dept. of Experimental Pathology.
J. R. Walton.
Nature, Vol 243, No 5402, p 100-101, May 11, 1973. 1 fig, 9 ref.

Descriptors: *Lead, *Laboratory tests, *Cytological studies, Calcium, Microbiology, Metabolism, Biochemistry, Heavy metals.
Identifiers: *Mitochondria.

Lead is accumulated in granules produced in isolated rat liver mitochondria following incubation in a lead-containing medium. The computed levels of free lead ion in the media ranged from 0.2 micromol to 100 micromol; by comparison, total plasma lead levels of up to 8 micromol have been found in victims of lead poisoning. Mitochondria were isolated with as little disruption as possible. Controls were incubated at 37 C for 30 minutes in calcium-free medium. The experimental samples were incubated in the same medium with the addition of 1 mM lead nitrate and 1.5 mM NTA. When metabolic inhibitors which operate at different points in energy pathways were added to the medium containing lead, granules were smaller and fewer. These results imply that mitochondrial uptake is a process dependent on energy. Further incubation with DNP yielded dispersal of Ca granules while the lead granules seemed to be unaffected, indicating that lead removal is a less readily reversible process. Therefore, if mitochondria accumulate lead in clinical lead poisoning as they do calcium under normal conditions, the subsequent removal of lead from the mitochondria would be physiologically difficult and excessive accumulation of lead cations would disrupt the ability of the cell to maintain itself metabolically and structurally. (Jernigan-Vanderbilt)
W74-09787

OUTBREEDING AND INBREEDING IN A ZINC-LEAD MINE POPULATION OF ARMERIA MARITIMA,
Brussels Univ. (Belgium).
C. Lefebvre.
Nature, Vol 243, No 5402, p 96-97, May 11, 1973. 3 tab, 7 ref.

Descriptors: *Genetics, *Plant breeding, *Zinc, *Lead, Fertility, Pollen, Reproduction, Plant physiology, Aquatic plants.
Identifiers: *Outbreeding, *Inbreeding, *Armeria maritima.

Previous studies have shown that self-fertility occurs in zinc-lead mine populations of normally incompatible plant species. In Armeria self-fertility has been assumed to be a mechanism enabling a reliable production of seeds in colonizing situations where individuals are both few and sparse. Inbreeding was artificially induced by enclosing inflorescences in paper bags. While this method did supply data on potential self-fertility, it did not give any idea about the efficacy of self-fertility in the mine population. Selfing obtained by artificial means can disappear in natural conditions. Through studying outbreeding estimates for a population of Armeria collected from a mine site in Belgium and carrying out progeny tests on three samples of the population to estimate the outbreeding coefficient according to the method of Vasek, there was evidence that inbreeding was not occurring in the population. Oubreeding is concluded to be complete at the present time in the mine population although some potential self-fertility has been shown artificially. (Jernigan-Vanderbilt)
W74-09788

HAND TREMOR INDUCED BY INDUSTRIAL EXPOSURE TO INORGANIC MERCURY,
Rochester Univ., N.Y. Dept. of Psychology.
R. W. Wood, A. B. Weiss, and B. Weiss.
Archives of Environemental Health, Vol 26, No 5, p 249-252, May 1973. 5 fig, 17 ref.

Descriptors: *Mercury, *Public health, *Industrial wastes, Inorganic compounds, Human pathology, Laboratory tests.

Individuals with long term exposure to substantial concentrations of metallic mercury vapor may display a number of symptoms including tremor, hesitancy and slurring of speech, blurred vision, and a central nervous system syndrome termed erethism. This study deals exclusively with hand tremor. Hand tremor induced by industrial exposure to inorganic mercury vapor was studied during recovery in two women patients. The subjects were instructed to maintain a force with the forefinger between two limits (10 to 40 gm). Performance progressively improved after cessation of exposure, and patients were asymptomatic in about 3.5 months. The dispersion of the amplitude distribution decreased and percent time within the specified limits increased. Power spectral analysis revealed a marked reduction in power associated with a change in the shape of the spectra. These changes were associated with a reduction in plasma levels of mercury. Graphs are included to illustrate findings which support the notion of a direct relationship between body burden of mercury and tremor severity. (Jernigan-Vanderbilt)
W74-09789

RELATION OF TRACE METALS TO HUMAN HEALTH,
Dartmouth Coll., Hanover, N.H. Dept. of Physiology.
H. A. Schroeder, and D. K. Darrow.
Environmental Affairs, Vol 2, No 1, p 222-236, Spring 1972. 50 ref.

Descriptors: *Metals, *Public health, *Human pathology, *Rodents, *Toxins, Laboratory tests, Lead, Mercury, Cadmium, Chromium, Beryllium, Reviews, Trace elements.
Identifiers: *Trace metals.

The effects of various trace elements on human health are reviewed in the light of annual industrial consumptions, natural abundances and changes in experimental animals fed low doses for life. A laboratory constructed of wood, covered with plastic varnish, on a remote Vermont hilltop was designed to exclude contaminating metals from air and water. Large numbers of rats and mice were exposed to single elements in low doses for a lifetime. Recondite toxicity was evaluated in terms of growth, life span, longevity, changes in serum tumors, microscopic pathology, disease, reproduction and tissue content of each of the 30 elements fed. Little or no subtle toxicity was shown by several metals. Toxic metals (lead, cadmium, nickel, antimony, beryllium, and mercury) and slightly toxic metals are discussed as to sources and effects. Fourteen metals and two nonmetals are essential for life or health of mammals. (Jernigan-Vanderbilt)
W74-09790

OCCUPATIONAL EXPOSURE TO MERCURY VAPORS AND BIOLOGICAL ACTION,
Louvain Univ. (Belgium). Unite de Toxicologie Industrielle et Medicale.
R. R. Lauwerys, and J. P. Buchet.
Archives of Environmental Health, Vol 27, No 2, p 65-68, August 1973. 5 tab, 24 ref.

Descriptors: *Mercury, *Toxicity, *Public health, *Metabolism, Human pathology, Analytical techniques, Testing procedures, Effects, Industries.
Identifiers: *Threshold limit value, Occupational exposure.

The purpose was to investigate whether biological manifestations could be detected in apparently healthy workers who for a few years ave been moderately exposed to mercury vapors. There is no international agreement yet in regard to the airborne concentration of mercury to which workers can be exposed during their working life without deleterious effect on their health. In the U.S., the threshold limit value (TLV) was recently reduced from 0.100 mg/cu m to 0.050 mg/cu m, while in the U.S.S.R. the permissible concentration of mercury vapor in air is only 0.010 mg/cu m. The following biological changes in workers exposed to airborne metallic mercury were detected: increased blood and urine mercury concentrations, increased plasma galactosidase and plasma catalase activities, decreased red blood cell cholinesterase activity. There is no indication that these slight biological changes have any health significance, however. A significant correlation was found between airborne mercury level and urinary mercury concentration (r=0.47), between mercury concentration in blood and in urine (r=0.36), and between airborne mercury concentration and RBC cholinesterase inhibition (r=0.33). (Jernigan-Vanderbilt)
W74-09793

5D. Waste Treatment Processes

CONCEPTUAL DESIGN EVALUATION OF A PHYSICAL-CHEMICAL DOMESTIC WASTE TREATMENT SYSTEM UTILIZING POWER PLANT WASTE HEAT,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
R. A. Fazzolare, and R. A. Sierka.
Available from the National Technical Information Service as PB-233 440, $3.00 in paper copy, $1.45 in microfiche. Completion Report, June 1974. 16 p, 6 fig, 5 ref. OWRR A-044-ARIZ(4). 14-31-0001-4003.

Descriptors: *Waste water treatment, *Sewage treatment, *Reclaimed water, *Nuclear power plant, Cooling water, Thermal pollution, Heated water, *Domestic water, *Design.
Identifiers: Heated sewage.

The use of power-plant heat in a physical-chemical domestic wastewater renovation system has been the subject of a three-year investigation in order to explore the feasibility of the concept. In this work conceptual process engineering designs are evaluated and further laboratory experiments are reported. Laboratory tests and preliminary engineering examinations reveal that the commercial exploitation of the concept of combining a wastewater treatment facility to a power plant, using the waste heat to enhance physical-chemical treatment and generating renovated water for condenser cooling, is a viable concept. Pilot plant studies are considered necessary for further engineering evaluations, and a pilot plant design is proposed.
W74-09253

EFFECT OF DETERGENT-LADEN WATER ON THE GROWTH OF CORN,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 3C.
W74-09256

APPLICATION OF SEWAGE SLUDGE TO AGRICULTURAL LAND IN MINNESOTA (FINAL ENVIRONMENTAL STATEMENT),
Agricultural Research Service, Washington, D.C.
T. W. Edminster.
Available from the National Technical Information Service, as EIS-MN-73-1813-F, $4.00 in paper copy. (1973). 38 p, 4 fig.

Descriptors: *Sewage sludge, *Water reuse, *Water pollution, *Water pollution control, *Terracing, *Sludge disposal, Non-structural alternatives, Soil conservation, Sludge treatment, Land use, Agriculture, *Minnesota, Project planning, Research and development, Environmental sanitation, Environmental effects, Crop production, Land management, Adoption of practices, Farm management.
Identifiers: *Environmental Impact Statements, Rosemont(Minn.).

A project is proposed to develop a practical and complete system for the handling and use of sewage sludge on agricultural land. The objectives of this proposal were two-fold. The first was to demonstrate safe, efficient and practical methods for the application of sewage sludge to land in harmony with agricultural usage while controlling pollution of surface and ground waters through a program of total water management. The second was to collect information on specific practices for land application of sewage sludge so that safe management guidelines can be developed for various soil, crop, and climatic situations in northern climates. The physical set-up is a 40-acre watershed, which will be level terraced with grassed back slope terraces with surface inlet tile drains. Three alternatives were considered: incineration of the sludge, landfill for its disposal, and various treatment processes. Favorable environmental impacts include development of a conservation system that will reduce sediment loss from the field, and wildlife cover will be provided. Further, such development of sludge uses will yield a favorable economic method of disposal with less adverse pollution effects, and tap a valuable resource now wasted. The adverse effects are minimal and remote, centering around the possibilities of overflow and spillage. (Sutton-Florida)
W74-09265

FINAL ENVIRONMENTAL STATEMENT, (OFFICE OF SALINE WATER)--FIVE YEAR EXTENSION RESEARCH AND DEVELOPMENT, PUBLIC LAW 92-60.
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 3A.
W74-09280

GENERAL PLAN FOR RECOMMENDED STORM DRAINAGE FACILITIES, MARION COUNTY, OHIO.
Brown (Floyd G.) and Associates, Ltd., Marion, Ohio.
Available from the National Technical Information Service as PB-221 521, $6.75 in paper copy, $1.45 in microfiche. Final report prepared for the Marion County Regional Planning Commission. May 1973. 62 p, 15 plates, 3 tab, 5 append. Ohio P-299-9.

Descriptors: *Storm drains, *Drainage systems, *Planning, Separated sewers, Storm runoff, Urban drainage, Administration, Project planning, Rational method, Flooding, *Ohio.
Identifiers: *Marion County(Ohio), Scioto River Basin(Ohio), Marion(Ohio), Oleotangy River Basin(Ohio), Sandusky River Basin(Ohio).

Existing storm drainage facilities, anticipated storm drainage needs, and the adequacy of existing systems to meet the projected needs for the year 2000 are examined. The inventory includes information on line locations, sizes, grades and conditions. Maps delineate both existing systems and proposed storm drains. Most of the villages and communities in Marion County have combined systems for carrying the flow of both wastewater and storm drainage. The majority of these are too small to provide adequate drainage during storms. Future land use and service areas in the county must be coordinated to permit an efficient storm drainage system. Projected population growth for the Marion Urban Area for 2000 is 78,000 (45,000 in 1970), incorporated villages 7,115 (5,450 in 1970) and unincorporated areas 89,565 (51,905 in 1970). Density of the Marion Urban Area is expected to remain fairly constant. Slight increases in density may occur in villages and unincorporated areas. Specific recommendations are made for each village. Phased construction is recommended, beginning with those villages with the greatest population and growth potential, with priorities assigned in the recommended storm drainage plan to provide guidance in constructing and financing the necessary improvements. No conclusions are made on the desirability of any of the alternative methods of administration, whether it be on a local, county or watershed basis. Appendixes include a discussion of the Rational Method of estimating storm runoff, design factors for storm drains and an environmental assessment. (Hoffman-North Carolina)
W74-09359

WATER BALANCE IN SEWAGE STABILIZATION LAGOONS,
North Dakota Univ., Grand Forks. Dept. of Civil Engineering.
G. O. Fossum.
Available from the National Technical Information Service as PB-233 482, $3.25 in paper copy, $1.45 in microfiche. Completion Report WI-221-014-72, August 1971. 38 p, 16 fig, 4 tab, 13 ref. OWRR A-009-NDAK(1). 14-31-0001-3234.

Descriptors: *Waste water treatment, Sewage treatment, *Seepage, *Sewage lagoons, *Oxidation lagoons, Mass transfer, Evaporation, Groundwater movement, Water quality standards, *Water balance, Solid wastes, Chlorides, Phosphates, Sulfates, Fluorides, Water levels.
Identifiers: Groundwater tables.

Site selections and construction details have often ignored seepage beyond the requirements that the lagoon bottom should be a relatively impervious material, such as clay, and no seepage into wells or groundwater supplies should be permitted. Enforcement of Water Quality Standards makes it necessary to retain high water levels in sewage lagoons for longer periods of time than has been done in the past. There have been complaints from adjacent land owners that lagoon seepage was damaging crop land, and damage claims have been filed through legal channels. A value is proposed for the coefficient, N, of .000271 in the mass-transfer equation. Use of this coefficient, the wind speed, and the humidity gradient permits calculation of evaporation. Also proposed is a seepage rate of .0032 feet per day which permits determination of seepage loss. Limitations on their usage are discussed. Evidence is presented showing definite effects on groundwater tables for distance of approximately 400 feet. Conditions which create serious damage to productivity or adjacent land for distances of 300 feet or more are discussed. Effects on groundwater quality as indicated by total solids, chlorides, sulfates, phosphates and fluorides are presented and related to natural and artificial topographic features.
W74-09361

AN EXPERIMENTAL STUDY OF A WASTE-WATER TREATMENT SYSTEM SUITABLE FOR SHIPBOARD USE,
Hydronautics, Inc., Laurel, Md.
C. E. Brown, M. Frommer, J. Ricklis, and A. Gollan.
Available from NTIS, Springfield, Va. 22151, as AD-764 448, Price $3.75 printed copy; $1.45 microfiche. Final Contract Report 734321.4.1 to U.S. Coast Guard, July 1972. 76 p, 29 fig, 9 tab, 6 ref. 734321. DOT-CG-12, 186-A.

Descriptors: *Waste water treatment, *Waste disposal, *Incineration, Sludge disposal, *Membrane processes, Reverse osmosis, Ships, Filtration.

A waste treatment system for ships uses membrane lined tubes for filtration and concentration and a compact pebble bed incinerator for sludge disposal. The incinerator was constructed and tested with satisfactory results burning a digested sludge of 6% solids concentration. Effluent quality and flux were measured for each membrane at several pressures and internal flow speeds. An overall concentration ratio for suspended solids of 130 was reached starting out with a typical raw sewage containing approximately 1000 ppm of total solids. Quality of the effluent was high, containing an average BOD of less than 75 ppm for the best membranes tested. Coliform count was reduced four orders of magnitude with average residuals of less than 1000 per 100 milliliter. (Knapp-USGS)
W74-09373

DISPOSAL OF AIRCRAFT WASHRACK WASTE WATER,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
B. D. Reinert.
Available from NTIS, Springfield, Va. 22151, as AD-763 095, Price $3.75 printed copy; $1.45 microfiche. Air Force Weapons Laboratory Technical Report AFWL-TR-73-33, June 1973. 36 p, 13 fig, 8 tab, 14 ref.

Descriptors: *Waste water treatment, *Oily water, *Cleaning, Aircraft, Sewage treatment, Facilities, Detergents, *Activated sludge, Coagulation, Centrifugation, Separation techniques, Dilution.
Identifiers: Wash water(Aircraft).

To evaluate methods of treating aircraft washrack waste water, tests included dilution in an activated sludge treatment plant, filtration through a synthetic media filter, and centrifugation using both continuous-flow and batch centrifuges. Activated sludge treatment was suitable at a 6% dilution with domestic sewage. The chemical oxygen demand and emulsified oil concentrations at this dilution were 1000 and 200 mg/liter, respectively. Coagulation of washrack waste water with alum, followed by filtration, was not economical because of the excessive chemical additions required. Centrifugation of washrack waste water was not feasible because oil removal was negligible even at relative centrifugal forces as high as 20,000. (Knapp-USGS)
W74-09376

TREATMENT OF ELECTROPLATING WASTES BY ION EXCHANGE,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
R. B. Lehmann.
Available from NTIS, Springfield, Va. 22151, as AD-767 229, Price $3.00 printed copy; $1.45 microfiche. Air Force Weapons Laboratory Technical Report AFWL-TR-73-124, August 1973. 33 p, 6 fig, 8 tab, 8 ref. Contract F29601-72-C-0024.

Descriptors: *Ion exchange, *Anion exchange, *Waste water treatment, *Heavy metals, Recycling, Waste reuse, Nickel, Copper, Cadmium, Zinc, *Industrial wastes.
Identifiers: *Cyanide, *Electroplating wastes.

Strong anion resins (Dowex MSA-1, Amberlite IRA-938, Duolite A-102D) and mixed bed systems (Dowex MSA-1 and MSC-1, Amberlite IRA-938 and IR-120 plus, Duolite A-102D and C-20) were tested in an attempt to find a satisfactory ion exchange system for the removal of cyanide and heavy metals (Ni, Cu, Cd, Zn) from dilute electroplating wastes. The strong anion resins remove both the cyanide and the metal as an anionic complex species. While the removal produces acceptable effluent for disposal into public sewage systems, the capacity of the resin decreases with successive regenerations. In some resin systems this decrease in capacity was as high as 56%. In addition, the regeneration liquids contain anionic complex metal cyanides which are unsuitable for recycling and require further treatment. (Knapp-USGS)
W74-09377

THE USE OF OCEAN OUTFALLS FOR MARINE WASTE DISPOSAL IN SOUTHEAST FLORIDA'S COASTAL WATERS,
Miami Univ., Fla. Sea Grant Institutional Program.
T. N. Lee, and J. B. McGuire.
Available from NTIS, Springfield, Va. 22151 as COM-73-10925 Price $3.00 printed copy; $1.45 microfiche. Coastal Zone Management Bulletin Series No 2, January 1973. 19 p, 5 fig, 4 ref. NOAA SG 2-35147.

Descriptors: *Waste water disposal, *Florida, *Outlets, *Outfall sewers, *Water pollution control, Water pollution sources, Sewage treatment, *Waste water treatment.

The ocean outfall method of sewage disposal as presently practiced in South Florida is unsafe and a detriment to the ecology and aesthetics of the area. Options for the improvement of the system are proposed. These are: extend all of the existing outfall lines to a depth of 300 to 400 feet; install diffusers to improve the mixing and initial dilution of the effluent; and provide secondary treatment with a high level of chlorination. Attempts should continue to find methods to remove viruses. (Knapp-USGS)
W74-09403

TREATMENT OF WASTEWATERS FROM MILITARY FIELD LAUNDRY, SHOWERS, AND KITCHEN UNITS,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
D. S. Lent, and R. G. Ross.
Available from NTIS, Springfield, Va. 22151 as AD-765 483 Price $3.50 printed copy; $1.45 microfiche. Report 2061, May 1973. 53 p, 15 tab, 2 append. IG 66 2708 DJ 39-10.

Descriptors: *Waste water treatment, *Military reservations, *Activated carbon, Electrolytes, *Polyelectrolytes, Water reuse.

A wastewater treatment process utilizing powdered activated carbon, a cationic polyelectrolyte and a modified standard Army water purification unit was evaluated for wastewaters from field mili-

tary showers, laundries, kitchen units, and a laundromat. A modified standard Army water purification unit (ERDLator) can be utilized effectively for treating wastewater generated in field operations. A high quality water is produced when treating shower and blended wastewaters. Blending the kitchen and laundry waters with shower water reduces or eliminates the problems encountered when treating the waters separately. Carbon sludge can be reused as a supplement to fresh carbon for treating the wastewater. The carbon sludge produced is easily dewatered, and the volume of sludge generated minimizes the sludge disposal problem. (Knapp-USGS)
W74-09410

PROCEEDINGS-WORKSHOP ON LAND DISPOSAL OF WASTEWATERS.
North Carolina State Univ., Raleigh. Water Resources Research Inst.
Available from the National Technical Information Service as PB-233 403 $4.50 in paper copy, $1.45 in microfiche. Report No 91, UNC-WRRI-73-91, (1973). 112p, (edited by James M. Stewart). Conference held in Raleigh, N.C., November 20, 1973. OWRR A-999-NC (39), 14-31-0001-3833.

Descriptors: *Land disposal, Ultimate disposal, Waste treatment, *Waste water treatment, *Irrigation, Recycling, Waste water disposal, Soil disposal fields, Water reuse, Economics, *Return flow.

Eight papers summarize the state of the art including United States and foreign operating experience, regulatory practices, geographical distribution and location of existing land disposal facilities, irrigation practices, land and soil management practices, interaction with soils, health aspects, aerosols, economics of land disposal of and irrigation with wastewaters, and land disposal treatment systems and criteria for animal, agricultural, and municipal wastes. (See also W73-09423 thru W74-09430) (McJunkin-North Carolina State)
W74-09422

LAND APPLICATION OF WASTEWATER,
Environmental Protection Agency, Washington D.C. Div. of Municipal Waste Water Programs.
B. L. Seabrook.
In: Proceedings of Workshop on Land Disposal of Wastewaters, November 20, 1973, Raleigh, N.C.: North Carolina University Water Resources Research Institute Report No 91, p 1-35, 1973. 1 fig.

Descriptors: *Waste water disposal, *Irrigation, Sprinkler irrigation, Water spreading, Waste water treatment, Sewage treatment, *Water reuse.
Identifiers: *Land disposal(Wastes).

A field survey was made of approximately 100 facilities in all climatic zones where community or industrial wastewaters are being applied to the land. Another survey was carried out to ascertain the nature and extent of State health and water pollution control regulations governing the use and control and land application systems. Land application of effluent is employed to provide supplemental irrigation water, to give economical alternative solutions for treating wastes and discharging them without causing degradation of rivers, lakes and coastal waters, and to overcome the lack of suitable receiving waters and eliminate excessive costs of long outfall lines to reach suitable points of disposal into large surface bodies of water. Although facilities of all types were surveyed, this report is primarily concerned with irrigation-type facilities for supplying supplemental water to crop areas, forest areas and unharvested soil cover acreages. Spray irrigation is the most frequently used (57 facilities) method of application, although most municipalities use more than one method. Ridge-and-furrow irrigation is used at 23 facilities and flooding irrigation by 34 systems. Industry generally uses spray irrigation. (See also W74-09422) (Knapp-USGS)
W74-09423

MANAGEMENT OF LANDS USED FOR WASTE DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
J. A. Phillips.
In: Proceedings of Workshop on Land Disposal of Wastewater, November 20, 1973, Raleigh, N.C.: North Carolina University Water Resources Research Institute Report No 91, p 37-41, 1973.

Descriptors: *Waste disposal, *Land management, *Waste water disposal, Landfills, Water spreading, Waste water treatment, Waste treatment.
Identifiers: *Land disposal(Wastes).

In order to manage land for waste disposal, a knowledge of the soil and its physical and chemical characteristics that occur in the waste field must be obtained. Soil physical properties that are of importance are soil depth, infiltration rates, texture, structure, types of clay, permeability, and porosity. Regardless of the use that is made of the land, care must be taken to prevent any waste or waste water from reaching the surface water or groundwater in order not to violate water quality standards. If the land is to be used for waste disposal solely or is dedicated for the disposal of waste only, the main criterion is the protection of the environmental quality. However, if crop production is to be coupled with the waste disposal, the amount that is to be applied to any particular crop would be determined by the current fertility levels of the soil and the fertility needs of the crop itself. (See also W74-09422) (Knapp-USGS)
W74-09424

WASTEWATER AND SOIL INTERACTION,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
B. L. Carlile.
In: Proceedings of Workshop on Land Disposal of Wastewaters, November 20, 1973, Raleigh, N.C.: North Carolina University Water Resources Research Institute Report No 91, p 43-47, 1973.

Descriptors: *Waste disposal, *Land management, *Waste water disposal, Landfills, Water spreading, Waste water treatment, Waste treatment.
Identifiers: *Land disposal(Wastes).

The application of any wastes on land may be considered a recycling process for the essential nutrients and biodegradable organics but only a disposal repository for all other nonessential and nondegradable components. Loading factors to be considered in the design and successful operation of a land treatment system are hydraulic loading, nutrient loading, organic loading, salt loading, and toxic elements. Good soil and water conservation practices are needed to prevent direct runoff of wastewater from the land to insure the percolation of the water through 4 or 5 feet of unsaturated soil which should remove pathogenic organisms. (See also W74-09422) (Knapp-USGS)
W74-09425

HEALTH ASPECTS OF LAND APPLICATION OF WASTEWATER AT MILITARY INSTALLATIONS,
Army Medical Research and Development Command, Washington, D.C. Sanitary Engineering Research Branch.
J. P. Glennon.
In: Proceedings of Workshop on Land Disposal of Wastewaters, November 20, 1973, Raleigh, N. C.: North Carolina University Water Resources Research Institute Report No 91, p 49-67, 1973. 6 ref.

Descriptors: *Waste water disposal, *Irrigation, *Public health, Military reservations, Sprinkler irrigation, Sewage treatment, Waste water treatment.
Identifiers: *Land disposal(Wastes).

The Army's program in the health effects of land disposal of wastewater includes studies on heavy metals, pesticides, biological aerosols, and microbial soil and groundwater contamination. Techniques are available for monitoring heavy metals and pesticide residues at land disposal sites. Waste-water disinfection and buffer zones bordering spray sites insure that land disposal of wastewater has no adverse impact on the environment. (See also W74-09422) (Knapp-USGS)
W74-09426

ECONOMICS OF ALTERNATIVE WASTEWATER TREATMENT SYSTEMS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
M. R. Overcash.
In: Proceedings of Workshop on Land Disposal of Wastewaters, November 20, 1973, Raleigh, N.C.: North Carolina University Water Resources Research Institute Report No 91, p 69-74, 1973. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Sewage treatment, Tertiary treatment, Nitrogen, Phosphorus, Waste water disposal, Installation costs, Operating costs, Economics.
Identifiers: *Land disposal(Wastes).

Secondary treatment costs 30 to 32 cents per thousand gallons. Phosphorus and nitrogen removal add 25 to almost 60 cents per thousand gallons in addition to secondary treatment. Economic differences between land disposal and secondary treatment are important, particularly as federal requirements go beyond secondary treatment. (See also W74-09422) (Knapp-USGS)
W74-09427

IRRIGATION COST FOR LAND DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. E. Sneed.

Descriptors: *Waste water disposal, *Economics, *Sprinkler irrigation, Installation costs, Operating costs, Tertiary treatment, Cost-benefit analysis.
Identifiers: *Land disposal(Wastes).

Any type of irrigation system for land disposal of waste should be a complete system. The designer must know the soil characteristics, the composition and strength of the wastes, and the amount of wastes to be applied. The irrigation system should be designed to meet all these criteria; it should be a complete system capable of handling the wastes in a safe and economical manner. For land disposal, automated systems are most satisfactory and the easiest system to automate is probably a permanent sprinkler system. Initial cost is about $1,400 per acre. Operational cost is about $0.10 per 1000 gallons based on a 1,000,000 gallon-per-day plant. (See also W74-09422) (Knapp-USGS)
W74-09428

COSTS AND RETURNS OF LAND SPREADING WASTWATER,
North Carolina State Univ., Raleigh. Dept. of Economics.
G. A. Carlson.
In: Proceedings of Workshop on Land Disposal of Wastewaters, November 20, 1973, Raleigh, N.C.: North Caina University Water Resources Research Institute Report 91, p 81-89, 1973. 1 fig, 1 tab.

Descriptors: *Waste water disposal, Economics, *Sprinkler irrigation, Installation costs, *Operating costs, Tertiary treatment, Cost-benefit analysis.

Identifiers: *Land disposal(Wastes).

Substitution of land spreading for other forms of advanced waste treatment is a viable alternative that many cities and towns are now considering. Some of the factors affecting net land spreading costs are reviewed. The effect of minimum barrier distance requirements on land costs, the expected increased return to receiving sites when irrigated, and storage costs are discussed. (See also W74-09422) (Knapp-USGS)
W74-09429

TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
F. J. Humenik.
In: Proceedings of Workshop on Land Disposal of Wastewaters, November 20, 1973, Raleigh, N.C.: North Carolina University Water Resources Research Institute Report 91, p 91-103, 1973. 1 fig, 5 tab.

Descriptors: *Waste water treatment, *Waste water disposal, *Farm wastes, *Municipal wastes, *Irrigation, Nutrients, Sewage treatment, Anaerobic digestion, Lagoons.
Identifiers: *Land disposal(Wastes).

Many of the simple systems developed for the pretreatment and terminal disposal of agricultural waste on land can be applied to municipal waste and in particular are very feasible for the treatment of rural domestic waste. Unaerated ponds can provide significant pretreatment at a very low cost. The treatment efficiency of ponds can be increased by utilizing series systems and providing aeration in the first unit. Pond systems can also be managed to facilitate nitrification-dentrification when aeration is employed in the first unit, and the second unit is maintained anaerobic by direct raw waste inputs. Pond systems must be considered as pretreatment devices prior to land irrigation of excess liquid. Land irrigation is limited either by the hydraulic or process load. The gigher degree of treatment provided or the lower the concentration of nitrogen, the less value the excess water has for fertilization and the more controlling hydraulic loading becomes. Current recommended loading rates are to apply no more nitrogen than fertilizer recommendations for a particular vegetative cover. Therefore, the most economic approach is to balance both the hydraulic and process load so that the application limit for both liquid and nitrogen closely interrelate for each waste stream. (See also W74-09422) (Knapp-USGS)
W74-09430

STABILITY AND CONTROL OF ANAEROBIC DIGESTION,
Metropolitan Sanitary District of Greater Chicago, Ill.
S. P. Graef, and J. F. Andrews.
Journal Water Pollution Control Federation, Vol 46, No 4, p 666-683, April 1974. 14 fig, 24 ref.

Descriptors: *Sludge digestion, *Anaerobic digestion, Control, *Waste treatment, *Computer studies, *Model studies, Organic loading, Toxins, Design standards, Operation and maintenance, Sludge treatment, Methane, Sludge, Alkalinity, Carbon dioxide, Digestion, Control systems.
Identifiers: *Overloads, Hydrocarbons, Control strategies, Stability, Process control.

The dynamic response of the anaerobic digester to organic, toxic, and hydraulic overloading was simulated with a hybrid computer to evaluate process stability indicators, design and operation factors influencing process stability, and control strategies. The rate of methane production was one of the best indicators for detecting impending failure caused by toxic compounds. Improved process stability with respect to organic overloading can be achieved by increasing the residence time, alkalinity, influent sludge concentration, and digested sludge recycle. Three control strategies (scrubbing of carbon dioxide from the gas phase with subsequent gas recycle, addition of a base, and digested sludge recycle) were investigated. Consideration of process stability and implementation of control strategies could improve digester operation, permit increased loadings on existing digesters, and decrease the required volumes of new digesters. (Witt-IPC)
W74-09434

KINETICS OF ACTIVATED SLUDGE OXYGENATION,
Texas Univ., Austin. Dept. of Civil Engineering.
M. J. Humenick, and J. E. Ball.
Journal Water Pollution Control Federation, Vol 46, No 4, p 735-747, April 1974. 10 fig, 2 tab, 31 ref.

Descriptors: *Activated sludge, *Aeration, *Oxygenation, *Kinetics, *Sludge digestion, Settling velocity, Sludge, Dissolved oxygen, *Waste water treatment, Oxygen, Laboratory tests, Odor, Waste treatment, Benefits, Oxygen demand, Biological treatment.

A laboratory-scale activated sludge reactor was used to determine the effect on sludge settleability, kinetics, and sludge production of using pure oxygen versus air in the aeration stage. No significant differences were found in the sludge yield coefficient, decay coefficient, or substrate removal kinetics, whether using air or oxygen. Neither were there any significant differences in the initial settling velocity of activated sludge in the zone settling region. The initial settling velocity was found to be a function of the mean cell retention time and the intensity of previous mixing. Although the kinetic and growth characteristics of activated sludge developed under oxygenation seem to be the same as under aeration, several inherent advantages may be realized by the use of high-purity oxygen. Benefits may include the ability to supply high oxygen demand at the influent end of a reactor, odor control advantages of a closed system, significant dissolved oxygen concentrations in the plant effluent, efficient oxygen transfer at low mixing velocities, reduced reactor size, higher possible food-to-microorganism ratios, less net sludge production, and reduced size of sludge-processing equipment. (Witt-IPC)
W74-09437

THERMAL SLUDGE CONDITIONING IN KALAMAZOO, MICHIGAN,
Kalamazoo Dept. of Public Works, Mich.
D. H. Swets, L. Pratt, and C. C. Metcalf.
Journal Water Pollution Control Federation, Vol 46, No 3, p 575-581, March 1974. 5 fig, 5 tab.

Descriptors: *Sludge treatment, Heat treatment, Treatment facilities, *Dewatering, *Incineration, *Municipal wastes, Operating costs, Operations, Operation and maintenance, *Michigan.
Identifiers: *Kalamazoo(Mich), *Thermal conditioning, Sludge conditioning, Vacuum filtration, Thickeners.

The city of Kalamazoo, Michigan, operates a thermal sludge conditioning system to treat sludge from its waste water treatment plant. Sludge from the existing thickeners is treated in three conditioning units, each having a capacity of 32.5 tons (29.5 metric tons) of dry solids/day. Each unit is designed to operate at 25% above the normal 400 psi (28 kg/sq cm) pressure and consists of a sludge grinder; centrifugal feed pump; positive-displacement, diaphragm-exchange, high-pressure sludge pump; heat exchangers; reactor; steam generator; gas-liquid separator; and pressure control valves. The sterile treated sludge is thickened in two 70 ft. (21.3 m) diameter thickeners with rotating rake mechanism and dewatered on three vacuum filters without the use of chemical flocculants. The dried sludge is incinerated. Process vapors from the sludge thickening tanks are discharged into the incinerators as combustion air. The operating characteristics of the thermal conditioning plant and associated operational problems are discussed. The operating cost/ton of sludge processed (excluding operating and maintenance labor) is given. (Witt-IPC)
W74-09439

KINETICS OF SUBSTRATE ASSIMILATION AND PRODUCT FORMATION IN ANAEROBIC DIGESTION,
Institute of Gas Technology, Chicago, Ill. Div. of Bioengineering Research.
For primary bibliographic entry see Field 5B.
W74-09440

DEWATERING DIGESTED PRIMARY SLUDGE,
Los Angeles County Sanitation District, Calif.
J. D. Parkhurst, R. P. Miele, S. T. Hayashi, and R. F. Rodrigue.
Journal Water Pollution Control Federation, Vol 46, No 3, p 468-484, March 1974. 12 fig, 6 tab.

Descriptors: *Sludge treatment, *Dewatering, *Centrifugation, *Operating costs, *Pilot plants, Costs, Economics, Solid wastes, Polymers, Anaerobic digestion, Sludge, Solid wastes, Separation techniques, Treatment facilities, Additives, *California, Sludge digestion.
Identifiers: *Los Angeles County(California).

A sludge dewatering research project was conducted at the Joint Water Pollution Control Plant of the County Sanitation Districts of Los Angeles County (California) to find a system capable of recovering at least 95% solids from anaerobically digested primary sludge. Fourteen months of pilot plant studies revealed that five conditioning-dewatering schemes were capable of satisfying the requirement. Based on performance and economic factors, a two-stage centrifugation system using horizontal scroll centrifuges followed by basket centrifuges was selected. Cationic polymer was used to condition the basket centrifuge feed. The unit cost for dewatering 300 dry tons/day (272,100 kg/day) was estimated to be $29/ton ($0.032/kg). (Witt-IPC)
W74-09441

REUSE AND RECYCLE OF WATER IN INDUSTRY,
Bostock Hill and Rigby, Birmingham (England).
C. J. Appleyard, and M. G. Shaw.
Chemistry and Industry, No 6, p 240-246, March 16, 1974. 2 tab, 10 ref.

Descriptors: *Water reuse, *Recirculated water, *Industrial water, *Waste water reclamation, *Waste water treatment, *Recycling, *Impaired water use, *Reclaimed water, *Water conservation, Chemical industry, Food processing industry, Electronics, Steel, Metallurgy, Mining, Water pollution control, Chemcontrol, Economics, Cost-benefit analysis, Regulation, Legal aspects.

The status and prospects of water reuse in various industries are reviewed, including case histories from the food, electronic, and steel industries. Treatment techniques prior to water recycling are surveyed. Motivation for increased recycling will come from stricter water quality standards, diminishing availability of resources, and greater cost of clean water. The first consideration by industry will remain direct savings accruing from minimized freshwater intake and process losses. Direct reuse of sewage effluent as industrial or second-class water requires further study, particularly in heavily industrialized areas with short transport distances. Present technology seems already adequate, and future trends may lie in chemical-physical treatments combining several high-rate processes to provide better than expected economies. (Brown-IPC)
W74-09444

INPLANT PH CONTROL PERMITS OPTIMUM AERATION EFFICIENCY,
Weyerhaeuser Co., Everett, Wash.
F. B. Howard.
Pulp and Paper, Vol 47, No 13, p 108-111, Dec., 1973. 3 fig, 1 tab.

Descriptors: *Waste water treatment, *Hydrogen ion concentration, *Aeration, *Pulp wastes, *Bleaching wastes, Mixing, Control systems, Control, Pulp and paper industry, *Washington, Alkalinity, Acidity, Lime, Calcium carbonate, Biochemical oxygen demand, Biological treatment.
Identifiers: Kraft mills, Chemical recovery, pH control, Black liquors, Spent pulping liquors, *Everett(Wash).

Difficulties in meeting BOD reduction requirements led to installation of a secondary aeration process at Weyerhaeuser Co.'s kraft mill in Everett, Washington. The pH of combined mill effluents from the primary treatment varied from 2 to 12, much too widely for effective secondary treatment for which pH 6-8 is the best range. The proper sequencing of combining separate effluents was found to be the key to total effluent pH control. Particularly, by combining the acid bleach plant waste with the alkaline stream from the chemical recovery plant which contains calcium carbonate and hydroxide, the total effluent's pH was brought within the desired range most of the time. Occasionally, an additional amount of lime had to be added. (Hansen-IPC)
W74-09445

TREATMENT AND DISPOSAL OF CHEMICAL PHOSPHATE SLUDGE IN ONTARIO,
Ontario Ministry of the Environment, Toronto.
G. L. Van Fleet, J. R. Barr, and A. J. Harris.
Journal Water Pollution Control Federation, Vol 46, No 3, p 582-587, March 1974. 14 ref.

Descriptors: *Phosphorus compounds, *Canada, *Waste water treatment, *Municipal wastes, Chemical wastes, International Joint Commission, Laboratory tests, On-site tests, Treatment facilities, Programs, Project planning, Pollution abatement, Lakes, Great Lakes.
Identifiers: *Ontario(Phosphorus discharge control).

Ontario is involved in a 5-year program to control, by 1975, phosphorus discharges from more than 200 existing municipal waste water treatment plants serving a population of 4.7 million. Phosphorus removal facilities must be installed and operational in 75% of these plants by the end of 1973. The program is a response to International Joint Commission recommendations on the Lower Great Lakes and the demonstrated need for nutrient controls in prime recreational waters throughout Ontario. Existing waste treatment ranges from lagoons to activated sludge and tertiary treatment processes, with plant capacities up to 180 million gallons/day. The integration of chemical treatment into these processes has required a broad program of research that, to date, has involved laboratory and full-scale investigations at more than 60 plants. (Witt-IPC)
W74-09447

CLEANING PAPER INDUSTRY EFFLUENTS BY MEANS OF ACTIVATED CARBON (UEBER DIE REINIGUNG PAPIERINDUSTRIELLER RESTABWAESSER MITTELS AKTIVKOHLE),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
W. Brecht, and H-L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol 101, No 14, p 501-513, July 31, 1973. 11 fig, 8 tab, 24 ref. English summary.

Descriptors: *Waste water treatment, *Pulp wastes, *Activated carbon, *Biological treatment, *Comparative costs, *Comparative benefits, Effluents, Biochemical oxygen demand, Color, Chemical oxygen demand, Costs, Operating costs, Organic loading, Foreign research, Europe, Particle size.

Granular activated carbon, which can be regenerated, was found suitable for the practical adsorption of BOD loadings from pulp and paper mill effluents. The theory and practice of this process are discussed. Experiments indicate that the carbon particles should not be too fine, that the effluent load should not exceed 100 mg of 5-day BOD/liter, and that frequent backwashing of the adsorbent should be performed. Under these conditions, the process can replace biological purification. Complete color removal and increased COD reduction are its main advantages, albeit at somewhat higher costs than for biological treatment. The possibility of combining bio-purification with activated C treatment is recommended for study. (Speckhard-IPC)
W74-09450

AVAILABLE AIR MEASUREMENTS APPLIED TO FLOTATION THICKENER EVALUATIONS,
CH2M/Hill, Inc., Corvallis, Oreg.
K. V. Leininger, and D. J. Wall.
Deeds and Data (Water Pollution Control Federation), p D1, D4-D8, May, 1974. 6 fig, 1 tab, 9 ref.

Descriptors: *Treatment facilities, Equipment, *Flotation, *Sludge treatment, *Dewatering, *Air entrainment, *Air demand, Pressure, Saturation, Dissolved oxygen, Sampling, Water sampling, Mathematical studies, Operation and maintenance, Flow, Suspended solids, Sludge digestion.
Identifiers: *Thickeners(Dewatering filters), Calculations(Computations), Clarifiers.

Studies of flotation thickeners seldom give proper estimates of the air volume actually available for flotation of sludge. Conventional calculations of air balance in a pressurized saturation system do not verify that all the air is actually being dissolved, nor do they provide direct measures of the air available for flotation. A new sampling method is presented which does determine this air volume. It measures the air released from solution upon depressurization of a highly saturated flow as it leaves a pressurized dissolved-air system. Example calculations are presented for the percent saturation efficiency of a pressurized system and for the air:liquid ratio of the pressurized flow to a flotation process. The calculated available air supply rate can be divided by a known or desired solids loading rate to determine the available air:solids ratio for any particular application, which is one of the most important factors in flotation thickening. (Brown-IPC)
W74-09451

OXIDATION AND AERATED LAGOON OPERATION,
Safford Municipal Utilities, Ariz.
E. R. Etter.
Deeds and Data (Water Pollution Control Federation), p D2-D3, May, 1974.

Descriptors: *Lagoons, *Aerated lagoons, *Operation and maintenance, *Waste water treatment, *Monitoring, *Water quality control, Sodium compounds, Nitrates, Algae, Color, Odor, Hydrogen ion concentration, Dissolved oxygen, Weed control, Temperature, Weather patterns, Optimization, Pondweeds.

The prime responsibility of a pond operator is to monitor and aid natural processes of waste treatment by providing an optimum environment. He should watch for signs of pond imbalance (water color, floating surface matter, odor evolution, and conditions of banks) and of septicity. He should keep records of dissolved oxygen, pH, relative stability, temperature, and weather conditions; remove weeds from the water; and have sodium nitrate available to prevent algal dieoff. (Brown-IPC)
W74-09452

STUDIES ON INTERNAL REUSE OF SULFITE EVAPORATOR CONDENSATES (UNTERSUCHUNGEN ZUR INNERBETRIEBLICHEN WIEDERVERWENDING VON SULFITABLAUGENEINDAMPFKONDENSATEN),
Institut fuer Zellstoff und Papier, Heidenau (East Germany).
B. Bach, G. Fiehn, and H. Schmidt.
Zellstoff and Papier, Vol 22, No 12, p 355-363, Dec 1973. 3 fig, 13 tab, 18 ref.

Descriptors: *Water reuse, *Impaired water use, *Sulfite liquors, *Pulp wastes, *Recirculated water, Condensation, Evaporation, *Water conservation, Industrial water, Pulp and paper industry, Pollution abatement, Water pollution control, Recycling, Biochemical oxygen demand, Chemical oxygen demand, Ion exchange, Anion exchange, Effluents, Water pollution sources.
Identifiers: *Evaporator condensates, Spent sulfite liquors, Sulfite pulp mills, Bleach plants, Pulp washing, Wash water.

A study of the composition and properties of spent sulfite liquor evaporation condensates indicated severe increases in BOD and COD of sulfite pulp mill effluents loaded with such condensates. In many Scandinavian sulfite mills, these condensates are, therefore, recycled either to the cooking liquor preparation or to the pulp washing stage, despite some ensuing operating problems. Two possibilities for internal reuse are proposed: (1) Untreated condensates might be reused in the bleach plant. (2) Partial purification by anion exchange would reduce the BOD by 50-60% and the COD by 70-75%, so that the treated condensates could be used in lieu of fresh water for pulping and pulp washing without adverse effects on pulp quality. (Ward-IPC)
W74-09453

PULP MILL WASTE WATERS: DISCHARGE AND PURIFICATION (ZELLSTOFFABWAESSER: ANFALL AND REINIGUNG),
Technische Hochschule, Vienna. (Austria). Institut fuer Wasserversorgung Abwasserreiningung und Gewasserschuts.
W. V. D. Emde, H. Fleckseder, L. Huber, and K. Viehl.
Wiener Mitteilungen Wasser, Abwasser, Gewaesser, Vol 13, June, 1973, 420 p. 69 fig, 8 tab, 1 map, 130 ref, append.

Descriptors: Waste water(Pollution), *Discharge(Water), *Water purification, Pulp and paper industry, Pollution abatement, Europe, *Pulp wastes, Water pollution control, *Air pollution, *Waste water treatment, *Water reuse, *Water conservation, Sulfite liquors, Wood wastes, Effluents, Water pollution sources.
Identifiers: *Austria, Kraft mills, Sulfite pulp mills.

A study was commissioned by the Austrian Department of Agriculture and Forestry to survey the extent of water pollution by pulp and paper mills and to recommend practical countermeasures. In 9 chapters and an appendix (excerpted from Fleckseder's doctoral dissertation), the volume outlines the following topics: The technological and economic development and status of the Austrian (and some foreign) pulp and paper industries, with emphasis on environmental impacts. The chemistry of wood and the technology of pulp manufacture. In-plant measures for water recirculation and conservation, spent liquor disposal, and by-product recovery. External effluent-treatment processes and facilities, including solids removal, flocculation, chemical coagulation, the Elektro-M-process, screening, filtration, sedimentation,

flotation, BOD removal, aerobic-anaerobic aerated and nonaerated ponds and lagoons, activated sludge processes, trickling filters, color removal, adsorption, reverse osmosis, sludge handling and disposal, fines recovery from white waters and barking wastes, and the like. Air pollution and its control. Costs of antipollution installations for sulfite and kraft pulp and paper mills. Finally, recommendations are presented in general and specific terms for new and old sulfite mills and for existing kraft mills in the interest of pollution abatement. A selective bibliography of pertinent literature citations is appended. (Brown-IPC)
W74-09455

ULTRAFILTRATION SETS SAIL FOR NEW PROCESS SERVICES.
Chemical Engineering, Vol 81, No 4, p 88-89, Feb 18, 1974. 2 fig.

Descriptors: *Membrane processes, *Waste water treatment, *Filtration, *Reverse osmosis, *Treatment facilities, *Equipment, Effluents, Pulp wastes, Chemical wastes, Chemical industry, Pulp and paper industry, Textiles, Paints, Metals, Detergents, Industrial wastes.
Identifiers: *Ultrafiltration, Ucarsep ultrafiltration system.

The 'Ucarsep' ultrafiltration system developed by Union Carbide Corp. can treat highly corrosive, solvating, and abrasive solutions at all practical liquid temperatures (up to 200 F) and pH values (2-14). The equipment uses porous carbon tubes as supports which are coated on their internal surfaces with separation membranes made of any one of several proprietary (not disclosed) inorganic compounds that are matched to the respective end-use requirements. A typical unit rated at a capacity of 2000 to 5000 gal/day comprises 151 tubes 48 inch long with 0.25 inch inside diameter, all housed in a shell of 6 inch diameter. At 100 psi pressure, its permeation rate exceeds 100 gal/sq ft/day. Typical applications of Ucarsep units include removal of oil and dirt from hot alkaline detergent solutions used for metal cleaning prior to painting, recovery and concentration of paint pigments from electroplating rinse waters, removal of textile size from aqueous effluents, and clear water recovery from black liquors and other pulp and paper mill effluents. (Witt-IPC)
W74-09456

STUDIES ON RENOVATION OF PULP MILL WASTE WATER: PILOT-PLANT TESTS FOR GRANULAR ACTIVATED CARBON ADSORPTION OF KRAFT PULP MILL WASTEWATER (IN JAPANESE),
Government Industrial Research Inst., Shikoku (Japan).
H. Kabeya, T. Fujii, and Y. Kimura.
Japan Tappi, Vol 27, No 11, p 543-553, Nov 1973. 10 fig, 7 tab, 7 ref. English summary.

Descriptors: *Waste water treatment, *Pulp wastes, *Lignins, *Adsorption, *Activated carbon, *Chemical oxygen demand, Bleaching wastes, Lime, *Pilot plants, Industrial wastes, Foreign research, Waste treatment, Pulp and paper industry, Operating costs, Efficiencies, Consumptive use, Flow rate.
Identifiers: Chemical consumption, Alkaline extraction, *Japan, Kraft pulp, Kraft mills, Bleach plants.

Pilot-plant adsorption columns of activated carbon granules were used to remove lignin from a lime-pretreated brown stock (unbleached kraft pulp) wash water (containing 12-26 ppm of lignin and 25-44 ppm of COD) and from an activated sludge-treated and subsequently lime-treated kraft bleach plant (alkaline extraction) effleunt (containing 33-120 ppm of lignin). Adsorption isotherms and chemical consumptions were measured. At a surface flow rate of 1.7 m/hr and a contact time of 140 min, 1 kg of dry carbon sufficed to treat 3530 liters (based on lignin removals) or 3090 liters (based on COD removals) of lime-pretreated effluent, compared to 310 liters (lignin basis) or 3670 liters (COD basis) of a non-pretreated dilute wash water which contained as much lignin as did the limed effluent. These results indicate that lime pretreatment improves the absorption of lignin on activated carbon, but has little effect on COD removal. For lignin removal from alkaline extraction (bleaching) effluent, 1 kg of dry carbon was consumed in treating a relatively small volume (130 liters only). This lower efficiency is attributed to the higher lignin concentration of the bleach plant effluent. (Brown-IPC)
W74-09457

CLEANING UP: PAPER INDUSTRY'S MESS,
For primary bibliographic entry see Field 5G.
W74-09458

INROADS TO ACTIVATED CARBON TREATMENT,
L. C. Gibney.
Environmental Science and Technology, Vol 8, No 1, p 14-15, Jan, 1974. 2 fig, 2 tab.

Descriptors: *Waste water treatment, Industrial wastes, *Pulp wastes, *Organic loading, *Phenols, *Color, *Activated carbon, *Sewage treatment, Effluents, Adsorption, Toxicity, Molecular structure, Organic compounds, Alcohols, Acids, Polarity, Costs, Operating costs.
Identifiers: Molecular weight.

The activated carbon treatment of waste waters for removal of organic compounds offers several advantages over other effluent treatment processes, notably low land requirements, low sensitivity to fluctuations in pollution loadings, high removal rates, immunity against toxic wastes, flexibility in design and operation of treatment facilities, and reactivation and reuse capacities. Cost estimates are given for an expanded-bed, two-stage absorption installation for treating 10 million daily gallons of clarified raw sewage. Extensive laboratory data on the removal of color, phenol, and total organic carbon (TOC) from textile, food, chemical, plastics, rubber, metal, pharmaceutical, petroleum, and paper mill effluents are summarized. In 72% of all samples treated with activated carbon, 85% or better TOC removals were achieved. In more than 90% of the samples, color removals of 98% and phenol removals of 99% were attained. Problems remain regarding the adsorption of low-molecular-weight contaminants (having less than three carbon atoms per molecule) and of highly polar compounds (acids and alcohols). (Buchanan-IPC)
W74-09461

A PRELIMINARY INVESTIGATION OF RADIATION-ENHANCED OXIDATION OF PULP MILL EFFLUENTS FOR COLOR REDUCTION,
Oak Ridge National Lab., Tenn.
F. N. Case, and E. E. Ketchen.
NCASI (National Council of the Paper Industry for Air and Stream Improvement, Inc.) Stream Improvement Technical Bulletin, No 271, Feb, 1974, 18 p. 3 fig, 12 tab.

Descriptors: *Waste water treatment, *Oxidation, *Pulp wastes, *Gamma rays, *Radiation, *Color, *Activated carbon, Pulp and paper industry, Research and development, Oxygen, Pressure, Effluents, Industrial wastes, Water purification, Waste treatment, Adsorption.

Color reductions of 90% or better in pulp mill effluents were achieved by gamma-irradiation in the presence of oxygen at 500 psi. Also explored was the in situ radiation-induced reactivation of spent carbon adsorbent, but with inconclusive results. (Buchanan-IPC)
W74-09464

WASTE WATER LOADS AND THEIR POSSIBLE REDUCTIONS IN THE FINNISH FOREST INDUSTRY (SUOMEN METSAETEOLLISUUDEN JAETIEVESIKUORMITUS JA SEN KEHITYSNAEKMAT),
Finnish National Water Board, Helsinki.
For primary bibliographic entry see Field 5B.
W74-09465

SOIL CLOGGING DURING INFILTRATION OF SECONDARY EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. C. Rice.
Journal Water Pollution Control Federation, Vol 46, No 4, p 708-716, April, 1974. 9 fig, 1 tab, 12 ref.

Descriptors: *Soil disposal fields, *Soil contamination, *Infiltration, *Clogging, *Waste water treatment, *Groundwater recharge, Suspended solids, Infiltration rates, Hydraulic gradient, Algae, Soils, Soil dynamics, Soil physical properties, Soil moisture, Soil texture, Flooding, Water sources, Irrigation effects, Groundwater, Water types, Water resources, Water pressure, *Water reuse.

Maintaining high infiltration rates is a primary requirement when groundwater recharge facilities are used for reclamation of waste water effluent. Studies conducted in laboratory soil columns showed that clogging by suspended solids deposited on the soil surface was the predominant cause of infiltration reduction. Suspended solids concentrations should be kept below the 10 mg/liter for maximum infiltration. Soil clogging caused by biological activity was minimal. Algal growth on the soil surface restored the infiltration rate during inundation. High hydraulic gradients should be maintained when intermittent inundation schedules are used. (Witt-IPC)
W74-09467

BIOLOGICAL TREATABILITY OF TRINITROTOLUENE MANUFACTURING WASTEWATER,
Air Force Academy, Colo.
M. W. Nay, Jr., C. W. Randall, and P. H. King.
Journal Water Pollution Control Federation, Vol 46, No 3, p 485-497, March, 1974. 10 fig, 6 tab, 13 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Chemical industry, Biodegradation, Biochemical oxygen demand, Explosives, Biota, Metabolism, *Virginia, Toxicity, Microorganisms, Aquatic life, Nitrogen compounds.
Identifiers: *Trinitrololuene, *Radford(Va.) Army Ammunition Plant, Continuous process, Batch process.

A recent innovation in trinitrotoluene manufacturing has been the development of the countercurrent continuous flow process. Early studies that showed the waste to be toxic and refractory and the possibility of biological treatment to be marginal were done with waste samples from the older batch process. The new continuous process recycles many of the raw components to insure full use of their chemical potentials, and the waste water from this process is potentially more amenable to biological treatment. Biodegradability of trinitrotoluene waste water was demonstrated using dynamic BOD tests. The biota metabolism decreased as the trinitrotoluene concentration increased, illustrating that the waste has a threshold of toxicity to microbial systems. The rate of trinitrotoluene metabolism was slow compared with that of domestic waste water. A field-scale pilot plant for treating trinitrotoluene manufacturing wastes at the Radford Army Ammunition Plant in Virginia is proposed. (Witt-IPC)
W74-09470

FLOW SMOOTHING IN SANITARY SEWERS,
Environmental Protection Agency, Springfield, Ill.
C. N. Click, and F. O. Mixon.
Journal Water Pollution Control Federation, Vol 46, No 3, p 522-531, March, 1974. 16 fig, 2 tab, 11 ref. EPA 11010 FDI.

Descriptors: *Flow control, *Sewerage, *Waste storage, *Pipelines, *Economic feasibility, *Municipal wastes, Population, Interest rates, Cost comparisons, Flow characteristics, Design flow, Sewage treatment, Waste treatment.
Identifiers: Flow smoothing, *Flow smoothing basins, Relief piping.

Municipal waste water systems are usually designed with sufficient capacity to carry peak flows. However, as population grows and more load is placed on the normal municipal sewerage system, the point is inevitably reached at which the peak waste water flows exceed the design capacity of the sewerage system and additional capacity is needed. One possible way to provide this additional capacity is to install flow smoothing basins at key locations within the system. These basins would store waste water during periods of high delivery and release it later into the downstream piping at more nearly constant rates. A study was made to assess the feasibility of flow smoothing and to compare it with relief piping as a method of increasing the capacity of existing sewerage systems. The results show that circumstances that favor flow smoothing are high interest rates, high peak-to-average flow ratios, low pipe slopes, small pipe diameters, and low design depths of flow. Flow smoothing is strongly favored where earthen construction can be utilized. (Witt-IPC)
W74-09471

JOINT TREATMENT OF MUNICIPAL AND PULP MILL EFFLUENTS,
Green Bay Metropolitan Sewerage District, Wis.
K. G. Voelkel, D. W. Martin, and R. W. Deering.
Journal Water Pollution Control Federation, Vol 46, No 4, p 634-656, April, 1974. 14 fig, 11 tab, 11 ref.

Descriptors: *Municipal wastes, *Pulp wastes, *Activated sludge, *Waste water treatment, Pulp and paper industry, *Wisconsin, Bacteria, Chlorination, Nutrients, Sulfur bacteria, Pilot plants, Solids contact processes, Effluents, Industrial wastes, Sewage districts.
Identifiers: *Joint treatment, *Green Bay(Wis), Contact stabilization, Kraus process.

A project was undertaken to determine the feasibility of jointly treating Green Bay (Wisconsin) Metropolitan Sewerage District waste water with weak effluents from several paper manufacturers (American Can Co., Charmin Paper Products Co., Fort Howard Paper Co., and Green Bay Packaging Inc.), all located in Green Bay. Conventional, step aeration, contact stabilization, and Kraus activated sludge processes were studied simultaneously in four 1 gal/min (3.8 liters/min) pilot plants. Contact stabilization was selected as the most promising process and was studied further. After initial startup, the pilot plants became infested with the filamentous bacterium Thiothrix, a sulfur-storing organism. Chlorination of return activated sludge controlled its growth. Nutrient addition also was necessary. (Witt-IPC)
W74-09473

POSSIBILITIES FOR REDUCING THE EFFLUENT LOAD OF SULFITE PULP MILLS (MOEGLICHKEITEN ZUR BEHEBUNG DER ABWASSERBELASTUNG DURCH SULFITZELLSTOFFANLAGEN),
R. Fuechsel.
Das Oesterreichische Papier, Vol 10, No 9, p 13-15, 17-19, Sept, 1973. 6 fig.

Descriptors: *Treatment facilities, *Pollution abatement, *Pulp wastes, *Incineration, *Sulfite liquors, Water pollution control, Magnesium compounds, Magnesium hydroxide, Byproducts, Pulp and paper industry, *Waste water treatment.
Identifiers: *Sulfite pulp mills, *Chemical recovery, *Heat recovery, Copeland recovery process, Lenzing recovery process, Babcock recovery process, Spent sulfite liquors, Spent pulping liquors, Magnesium bisulfite.

Three systems for the recovery of chemicals and energy (heat) from magnesium-base spent sulfite pulping liquors are outlined and compared, all of which are effective in reducing the pollution load of discharged effluents. These systems make use of the Babcock, Lenzing, or Copeland recovery processes. The Babcock process involves co-current combustion, the Lenzing (Austrian) process counter-current combustion, and the Copeland process (developed by Container Corp. of America) fluidized-bed combustion of the spent liquors. The respective equipments used are described in some detail, including combustion chambers, absorption towers, venturi gas scrubbers, and the like. (Speckhard-IPC)
W74-09474

PAPER INDUSTRY AND ENVIRONMENTAL QUALITY,
International Paper Co., Ticonderoga, N. Y. Solid Waste Management.
C. S. Edgar.
Modern Lithography, Vol 40, No 8, p 12-15, 46, Aug, 1972. 2 illus.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Fibers(Plant), *Recycling, *Environmental control, Resources, *Water conservation, Solid wastes, Water reuse.
Identifiers: Closed systems, Linear systems, Wood, Waste paper.

Energy, raw materials, and waste disposal are separate but critically important and interconnected parts of the paper industry's total environmental problem. Nature solves its energy, resources, and waste problems by way of closed systems. Emulating this example, the industry's artificial linear system with waste as an end-product must be changed into a circular or closed system, in which waste must serve as a resource. Although the paper industry's major raw materials (wood and water) are renewable resources, problems are encountered in utilization of waste products remaining after consumer use. Recycling or reuse of secondary fibers (waste papers) is one way of resource utilization, but is neither the only way nor always the best one. (Witt-IPC)
W74-09475

THE BEHAVIORS OF HEAVY METALS IN THE REGENERATION PROCESS OF SEWAGE TREATMENT ACTIVATED CARBON, (GESUI SHORI KASSEITAN NO KANETSU SAISEIJI NI OKERU JUKINZOKU NO KYODO),
Yokohama National Univ. (Japan). School of Engineering.
K. Urano, and K. Nakamura.
Gesuido Kyokai-shi, (J. Japan Sewage Works Association), Vol 10, No 115, p 19-22, December, 1973. 6 ref.

Descriptors: Sewage treatment, *Activated carbon, *Tertiary treatment, Metals, Treatment facilities, *Heavy metals, Municipal wastes, Waste water treatment.
Identifiers: *Secondary pollution, Reactivation.

The possibility of causing air pollution as a secondary pollution during the regeneration of particulate activated carbon by a heating process utilized in various sewage treatment plants was examined by measuring the heavy metal content released from the carbon. Six kinds of activated carbons used at various treatment plants were dried, packed in quartz tubes, and heated at various temperatures between 200 deg and 960 deg C for 10 to 80 minutes. After heating, the carbon was cooled in nitrogen, and 100 ml of 25 percent nitric acid was added. After boiling for two hours the carbon was filtered, diluted by distilled water, and analyzed for copper, chromium, manganese, lead, zinc, and mercury by atomic absorption. The results showed that activated carbon utilized in sewage treatment contained (per 1 kg of dry material), 800-1700 mg Cu, 150-1800 mg Cr, 15-80 mg Mn, 5-20 mg Pb, 500-1700 Zn, and 0-5 mg Hg. Since activated carbon before being used for sewage treatment contained almost no heavy metals, it was assumed that metals adsorbed on carbon due to the treatment process were considerable. Hg compounds at 200 deg C or more, and Zn and Pb compounds at 800 deg C are gasified when regenerating carbon. Since part of these metals will be released in the flue gas, it is necessary to install flue gas treatment system for reactivating used activated carbon. (Seigle-FIRL)
W74-09482

THE LAND TREATMENT PROCESS FOR WASTEWATER RENOVATION,
Illinois, Univ., Urbana. Dept. of Agronomy.
T. D. Hinesly.
Public Works, Vol 105, No 2, p 62-66, February, 1974.

Descriptors: Land management, Land use, *Soil management, *Irrigation, *Mist irrigation, Infiltration rates, *Infiltration, *Percolation, *Water treatment, Municipal wastes, *Waste water treatment.

The land treatment process for wastewater renovation is discussed with emphasis on spray irrigation. There are three distinct types of land treatment systems: overland flow, rapid infiltration/percolation, and crop irrigation. An overland flow land treatment system is used for soils with very low infiltration and/or percolation capacities. Rapid infiltration/percolation systems are used where deep permeable soil materials are available. The crop irrigation system may embody various methods of applying secondary-treated effluents by spray applications or flooding on land through furrows or borders. Spray irrigation has the greatest applicability to different soil types and cultural practices. This treatment may be used on varying terrain, requires less land preparation, and is less labor intensive when compared to other methods of irrigation. Maximum benefits are realized from the plant and animal nutrients recycled in growing plants, which is a most important reason for choosing irrigation over other systems. Maintaining a water-unsaturated aerobic zone in the soil surface ensures more complete filtering and adsorbing of wastewater pollutants. The site should be selected so that the frequencies and rates of water applications will be limited by the soil's capacity to filter, absorb, and precipitate pollutants, rather than by soil hydraulic characteristics. (Merritt-FIRL)
W74-09486

SELECTION OF THE IRON AND MANGANESE REMOVAL PROCEDURES TO BE USED IN SMALL WATER TREATMENT PLANTS, (ALEGEREA SCHEMELOR DE DEFERIZARE SI DEMANGANIZARE A APEI LA STATIILE DE TRATARE MICI),
S. Nitescu.
Hidrotechnica, Vol 18, No 11, p 573-578, November, 1973. 13 ref.

Descriptors: Effluents, Municipal wastes, *Treatment methods, *Pilot plants, Aeration, Oxidation, Metals, *Iron, *Manganese, *Waste water treatment.

A simplified method for selecting the iron and manganese removal procedures to be used in small water treatment plants is presented. Usually the

removal procedures are selected by means of a pilot station. The cost of a pilot plant at a small treatment plant is high, due to the fact that the cost of the pilot station is almost equal to the cost of the production installation itself. Various factors have been verified which allows its elimination. The removal procedures are selected on the basis of physicochemical indices which are described and discussed. The procedures under consideration are aeration of water, oxidation of ferrous and manganese compounds, treatment with substances which increase the water's alkalinity, treatment of water with coagulant substances, decantation and filtration. Methods for differentiation of waters containing iron and manganese, treatment of water with mineral content, treatment of water with alkaline substances, or oxidizing substances, as well as methods for treatment of water with humic iron and manganese compounds, are presented. After selection of removal method, it is necessary to experiment on models in order to determine the optimum filtration parameters and chemical doses. (Urbanski-FIRL)
W74-09487

SPEED UP WATER PLANTS,
J. R. Camp, and W. J. Kreske.
Water and Wastes Engineering, Vol 11, No 1, p 27-29, January, 1974. 1 fig.

Descriptors: Water treatment, Flocculation, *Filtration, *Pre-treatment(Water), Costs, *Monetary benefits, Pilot plants, *Massachusetts, Municipal wastes, *Waste water treatment.
Identifiers: *New Bedford(Mass).

A process to condition floc for filtration is described that eliminates sedimentation, reduces the needed size of flocculation units, and cuts chemical costs, while giving faster throughput. The basis for the Thomas R. Camp process is the relationship of floc volume concentration to mean velocity gradient. The method as claimed in the patent, U.S. 3,660,284, applied to operating conditions whereby water of wastewater is treated with from 6-50 ppm of floc-forming chemical in a mixing chamber operating at a mean velocity gradient G corresponding to values of floc volume concentration between 50-300 ppm. The G values necessary to achieve the floc volume concentrations desired vary from about 150 to 1000 per second, and flocculation is essentially complete after five minutes of mixing at these speeds. A ten-month field test in New Bedford, Massachusetts, indicated that the Camp process was commercially feasible when applied to the highly colored water currently being used at New Bedford. The process saved New Bedford $1.75 million in capital for a new 30 mgd facility by eliminating the need for sedimentation basins. Savings in annual operating costs of a minimum of $15,000 could be achieved from reduced chemical requirements. (Merritt-FIRL)
W74-09488

PIONEERING PLANT PROVIDES COST-SAVING ALTERNATIVE TO SEPARATING SEWERS.
The American City, Vol 88, No 10, p 90-92, October, 1973. 2 tab.

Descriptors: Waste treatment, *Water treatment, Runoff, *Storm runoff, Lakes, *Cities, *Wisconsin, *Combined sewers, *Treatment facilities.
Identifiers: *Kenosha(Wisc).

A modified contact stabilization process to produce a high quality effluent under stormflow conditions was utilized in Kenosha, Wisconsin. The runoff is degritted, mixed with activated sludge solids, clarified, and stabilized in four additions to the existing waste treatment plan: grit tank, contact tank, final clarifier, and stabilization plant. The entire process is automated and directed from the plant's main control board. Wet weather conditions are signalled by a level indicator in the dry weather grit tank's Parshall flume when the flow rises above 21 mgd. Biological adsorption was used because the first flush of the storm contains a high ratio of praticulate organic matter to soluble organics. In the first year of operation, the wet weather plant was activated 23 times with more than 92 million gallons of combined sewage treated. As a result, 91.5 percent of the suspended solids, 82.5 percent of the BOD, and 79.8 percent of the total organic carbon in that waste stream was kept out of Lake Michigan. (Merritt-FIRL)
W74-09490

PLATING POLLUTION: THE LATEST FROM EPA, PART 1,
For primary bibliographic entry see Field 5B.
W74-09491

CHECKING THE SIZE OF SEWERAGE INFILTRATION AND LEAKS OCCURRING UNDER OPERATING CONDITIONS, (VERIFICAREA MARIMII INFILTRATIILOR SI EXFILTRATILOR DIN CANALIZARI IN TIMPUL EXPLOATARII),
E. Blitz, and G. Tatu.
Hidrotehnica, Vol 18, No 6, - 283-288, 1973. 6 ref.

Descriptors: *Sewers, Engineering structures, Municipal wastes, Mathematics, *Infiltration, *Mathematical studies.

Some simple tools for checking the degree of infiltration of sewage systems as well as calculation methods are presented. Sewage infiltration and leaks under operating conditions can affect the functioning of the sewage system and the neighboring constructions. Since not all sewers can be provided with improved modern checking devices, simple verification and calculation methods had to be devised. Calculation methods are given for both ovoidal and circular sewage sections, using both mathematical formulae and tables. (Urbanski- FIRL)
W74-09493

A CASE STUDY OF CHLORINE CONTACT TANK INADEQUACIES,
Illinois State Water Survey, Urbana. Water Quality Section.
V. Kothandaraman, and R. L. Evans.
Public Works, Vol 105, No 1, p 59-62, January, 1974. 3 fig, 2 tab, 11 ref.

Descriptors: Waste treatment, *Treatment facilities, *Illinois, *Dissolved oxygen, Coliforms, *Chlorine, Municipal wastes, *Waste water treatment, Chlorination.
Identifiers: *Chlorine Contact Tank.

The physical, chemical, and bacteriological performance characteristics of the chlorine contact tank of the Pekin, Illinois, waste treatment plant were evaluated under air agitated and quiescent conditions. The hydraulic flow characteristics were determined by adding Rhodamine-B dye at the outlet end of the circular launder of the secondary settling tank. Samples were taken at the outlet end. Simultaneously samples were obtained from the inlet and outlet ends of the chlorine contact tank for pH and temperature measurements, residual chlorine determinations, and bacteriological analyses. The injected dye took five to ten minutes to be completely mixed, depending upon the rate of flow through the tank. Chemical and bacterial performance characteristics of the chlorine contact tank with and without air agitation were determined. The dissolved oxygen at the outlet was high (3.3 to 6.0 milligrams/liter) even though the dissolved oxygen content of the settling tank effluent in the collecting launder was zero or 0.1 milligrams/liter. The residual chlorine of the effluent samples was relatively high, varying from 1.6 to 3.6 milligrams/liter. The fecal coliform count, which is the controlling parameter, was higher than the desired limit in six of eight samples. It was concluded that the residence time distribution of the flow-through in a contact tank is important in obtaining satisfactory bacterial quality. (Merritt - FIRL)
W74-09494

RESTORATION OF WASTEWATER FACILITIES DAMAGED BY TROPICAL STORM AGNES,
Environmental Protection Agency, Washington, D.C. Emergency Operations and Planning Div.
E. K. Ernstrom, G. H. Zachos, and D. E. Braunscheidel.
Water and Sewage Works, Vol 121, No 2, p 42-43, 51-52, February, 1974. 2 tab.

Descriptors: *Flood damage, *Storm runoff, *New York, Waste water treatment, *Treatment facilities, Costs, Sewage, Historic floods, Regional flood, Disasters, Estimates.
Identifiers: *Tropical storm Agnes, Steuben County, N.Y., Chemung County, N.Y., Allegheny County, N.Y.

The recovery and restoration of waste water facilities damaged by tropical storm Agnes in June, 1972 are described. The storm caused severe flooding in New York's Southern Tier counties. Waste water collection and treatment systems sustained several million dollars worth of damage. Individual municipal cases are discussed along with the reactions and roles of local, state, and federal officials. The Environmental Protection Agency assisted in the flood relief and concentrated its efforts in the following areas: emergency repairs to water and sewage utilities; removal of oil and hazardous materials in the disaster area; rendering a preliminary dollar estimate of damages to water and sewage utilities in all 62 counties; and performing initial inspections, detailed cost estimates, eligibility determinations, interim inspections, and final inspections on damaged public utilities in the 26 counties declared eligible. Top priority was given to restoring the public water supply systems. The current total of eligible damages to environmental facilities in the declared counties is $7,218,170, with over 60% of this damage in Chemung, Steuben, and Allegany counties. (Merritt - FIRL)
W74-09496

ECONOMIC IMPACT OF FWPCA WATER EFFLUENT STANDARDS AND GOALS.
Paper Trade Journal, Vol 158, No 13, p 34-38, April 1, 1974. 5 tab.

Descriptors: *Economic impact, *Federal Water Pollution Control Act, *Pulp and paper industry, Water quality, Effluents, Operating costs, Capital costs, Prices, Unemployment, Mills, Energy.
Identifiers: *Amendments, Balance of payments.

The national economic impact of the Federal Water Pollution Control Act Amendments on the paper industry in meeting the water effluent standards and goals is discussed. A survey was conducted to estimate the additional capital and operating costs that the existing paper industry would have to incur to achieve the two assumed water effluent control levels. The water effluent control costs over the range of mill sizes in each product category were compared with current product prices, anticipated profit margins for high cost mills, and the costs of competing foreign mills. It is estimated that $1,200 million will have to be spent for additional capital expenditures. It is estimated the average incremental operating cost for best practical control would increase from $4.50/ton average to $6.00/ton in 1977. There will be several inflationary effects in water effluent control expenditures especially during periods of tight supply/demand. Pulp and paper price increases to the consumer are expected to amount to 7.5-11% at the best practical control level and 19-

62% at the zero discharge level, depending on the product. Other effects include mill closure and unemployment, increased energy use, and impact on balance of payments. (Merritt - FIRL)
W74-09497

SEWAGE AND STORMS GET THE FULL TREATMENT,
R. J. Ganley.
Water and Wastes Engineering, Vol 11, No 1, p 30-31, 37, January, 1974.

Descriptors: *Waste water treatment, Sewage, *Sewage treatment, *Storm water, *New York, Activated sludge, Municipal wastes, *Treatment facilities.
Identifiers: *Catskill(N.Y.)

The construction of a $2.2 million sewage treatment plant capable of handling both storm and sanitary discharges in Catskill, New York, is described. A trickling plant was proposed with modifications to include the use of pre-aeration tanks equipped for the return of activated sludge, and a recirculation pumping rate controlled inversely to the raw sewage inflow rate. The plant can achieve 90-95 percent BOD removal through the use of high rate activated sludge pretreatment, and flow regulation to the primary tanks and trickling filters. The instrumentation and variable speed pumping equipment combining raw with recirculated sewage help provide the desirable constant flow rate to the primary settling tanks and trickling filters. The plant capacity of 1.5 mgd allows for the present Catskill population and its projected growth requirements. The plant is designed to allow a flow, including recirculation, of 3.8 mgd to pass through the primary clarifier and trickling filters before any of the flow is restricted to the filters and bypassed to the final clarifier. To avoid upsetting aerated pretreatment, the pretreated portion of the flow is restricted to approximately 50 percent of the dry weather flow which allows maintenance of the filterability of the raw sludge on the vacuum filters. The plant's raw sewage pumping capacity is 9.0 mgd. (Merritt - FIRL)
W74-09499

AGRICULTURAL WASTE MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE2, Paper 10470 p 363-368, April, 1974.

Descriptors: *Civil engineering, *Farm wastes, *Farm management, *Waste storage, *Waste disposal, Chemical wastes, Waste treatment, Water pollution sources, Pollution abatement, *Waste water treatment.

The role of civil engineering in the management of agricultural wastes is discussed. The problems with agricultural wastes are different from those commonly encountered in the management of municipal wastes. Serious problems have resulted when municipal waste technology has been transferred to the management of agricultural wastes without due consideration for the differences of generation characteristics and chemical characteristics of the waste materials. The management of animal manures requires the utilization of a system that somehow resolves the problems of separation of the manure from the animal, transport, storage or treatment or both and disposal. Under current technology, application to cropland is the most widely practiced disposal method. Treatment is for the purpose of making the manure more amenable to cropland application or for the purpose of changing its physical and chemical characteristics to avoid application difficulties or nuisances attributable to the application. (Merritt - SIRL)
W74-09504

SOME HISTORICAL STATISTICS RELATED TO FUTURE STANDARDS,
Wisconsin Univ., Madison.
P. M. Berthouex.
Journal of the Environmental Engineering Division, American Society of Civil Engineers Vol 100, No EE2, Paper 10468 p 423-437, April, 1974. 13 fig, 2 tab, 7 ref.

Descriptors: *Water quality standards, *Treatment facilities, *Construction, *Engineer estimates, *Forecasting, Design standards, Population, Statistical methods, Control, *Standards.

Areas of uncertainity that have relevance in the current water quality standards are discussed including treatment plant construction dilemma and the lack of precision in the language of the standards. Population and demand for forecasting have always added an unavoidable element of risk, but it is very possible that changing standards are the factor most likely to force redesign before the end of the intended design period. If control programs based on rational statistical methods are ever to be developed, it is necessary for effluent target levels and permissible variation to be clearly defined. In doing so, allowance should be made for natural variations and for analytical errors. Possible skewness in the distribution of results should also be noted and given consideration. When both a mean and upper performance level are set, the mean may be redundant if care is not taken to make the two levels consistent. This problem of consistency could be avoided most easily by simply using a 95% upper bound as the standard. (Merritt - FIRL)
W74-09505

STATE-OF-THE-ART OF WASTE DISPOSAL IN THE COATINGS INDUSTRY (AS OF JUNE 1973),
For primary bibliographic entry see Field 5E.
W74-09506

CONTROL OF BIOLOGICAL SOLIDS CONCENTRATION IN EXTENDED AERATION,
Cornell Univ., Ithaca, N.Y.
P-Y. Yang, and A. F. Gaudy Jr.
Journal of Water Pollution Control Federation, Vol 46, No 3, p 543-553, March, 1974. 10 fig, 2 tab, 7 ref. OWRR A-017-OKLA(2)+A-035-OKLA(2).

Descriptors: *Pilot plants, *Activated sludge, *Aeration, Recycling, Carbohydrates, Solids, Biomass, Hydrolysis, Waste water treatment.
Identifiers: Sludge proteins, Biological solids, Hydrolytic assist.

A 200-day test period showed that extended aeration activated sludge process with total sludge recycle can be operated successfully using hydrolytic assist to control the mixed liquor biological solids concentration. Thus, the process was made independent of natural periods of accumulation and de-accumulation of biological solids and showed a good ability to accept shock loading. Sludge carbohydrate and protein were within ranges indicating a metabolically active biomass, and the unit respiration activity of the sludge (endogenous 02 uptake values) was slightly higher than that obtained using total cell recycle without hydrolytic assist. Pilot plant operation using the process is still in progress to provide design and operating guidelines. (Prague-FIRL)
W74-09508

RAIN RESERVOIRS AND RAIN OVERFLOWS (REGENBECKEN UND REGENENTLASTUNGEN),
For primary bibliographic entry see Field 4A.
W74-09509

IRON REMOVAL IN MUNICIPAL TREATMENT PLANTS,
S. R. Goswami.
Water and Sewage Works, Vol 120, No 10, p 52-55, 82-84, October, 1973. 7 fig, 2 tab, 7 ref.

Descriptors: Treatment, *Groundwater, *Iron, *Waste water treatment, Municipal water, *Monitoring, *Oxidation-reduction potential.

The presence of iron in groundwater and through the various stages of treatment in selected municipal water treatment plants was related to data obtained in field studies at the same locations. Experimental parameters measured were pH, oxidation-reduction potential (Eh), temperature, alkalinity, dissolved oxygen, ferrous, filterable ferrous, and total iron. Field data at particular raw water wells and operational data of raw, aerated, filtered, and softened waters of municipal treatment plants treating iron-bearing groundwaters were compiled. The ranges of Eh for raw and aerated waters of treatment plants treating iron-bearing groundwaters are between 180 to 370 mv and 380 to 500 mv, respectively. The Eh is considerably increased by chlorination at any stage of treatment. The range of ferrous iron concentration varied from 1.30 to 9.09 mg. The Eh appears to be a useful analytical test in controlling the various stages of treatment of iron bearing groundwaters. There is a general correlation between the increase in Eh with decrease in filterable ferrous iron content. The variation of Eh from raw to finished water is an excellent parameter indicating the efficiency of treatment processes. The Eh measurements could be incorporated in the water treatment plants as an automatic monitoring device as used in waste treatment plants. (Merrill-FIRL)
W74-09510

STUDIES ON THE SUITABILITY OF MICROSTRAINERS FOR THE REMOVAL OF SUSPENDED MATTER FROM BIOLOGICAL CLEARING FACILITY EFFLUENTS (UNTERSUCHUNGEN UEBER DIE EIGNUNG DES MIKROSIEBES ZUR ENTNAHME SUSPENDIERTER STOFFE AUS DEN ABLAEUFEN BIOLOGISCHER KLAERANLAGEN),
B. Hanisch.
Schweizerische Bauzeitung, Vol 91, No 39, p 946-949, September, 1973. 6 fig, 2 ref.

Descriptors: *Filters, *Separation techniques, Bacteria, Suspended solids, Treatment, *Waste water treatment.
Identifiers: *Microstrainers.

Microstrainers for the removal of suspended matter from biological wastewater treatment plant effluents, and experiments with such microstrainers, are described. Microstrainers constitute horizontal rotary drums with very fine steel wire mesh of 23 or 35 microns on their surfaces through which the purified effluent passes from the inside to the outside. The retained particles form a filter layer on the inside of the drum, and thus help retain very small suspended particles. Zooglea bacteria are controlled by UV irradiation. The strainer resistance, i.e., the water level difference between the inside and the outside of the drum, ranges from 10 to 15 cm. Experiments with a microstrainer on the removal of suspended matter from biological wastewater treatment plant effluents revealed a retention efficiency of 33-91 percent from an effluent mixed return sludge, and a BOD5 reduction of 26-73 percent. Purified effluents from a percolation filter, passed through a microstrainer, experienced a reduction in their suspended matter content from 26-164 mg/liter to 5-36 mg/liter, and a BOD5 reduction from about 110 mg/liter to less than 25 mg/liter. The straining efficiency and the optimum operating parameters, such as the rotational and peripheral speeds, strain resistance, and flushing water expenditure, are basically determined by the properties of the suspended matter and of the strainer fabric. (Takacs-FIRL)
W74-09511

BETTER STORM DRAINAGE FACILITIES--AT LOWER COST,
H. G. Poetner.
Civil Engineering-American Society of Civil Engineers, Vol 43, No 10, p 67-70, October, 1973. 2 fig.

Descriptors: *Water storage, Storm water, *Storm runoff, Drainage systems, *Reservoir storage, Missouri, Missouri River, Illinois, Colorado, *Recreation, *Treatment facilities, Waste water treatment.
Identifiers: Indian Lake Estates, Denver, Melvina Ditch Reservoir.

Successful and economical applications of detention facilities for stormwater are described for use in open spaces, parking lots and rooftops. The design of the stormwater drainage system at Indian Lakes Estates in Illinois is illustrated. Two lakes detain stormwater runoff and make the area more attractive. One of the lakes is manmade and its existence has increased property value for adjoining acreage. In Earth City, Missouri, the Missouri River bottomland was developed with intersecting finger lakes providing stormwater detention. The lakes are an esthetic and recreational asset to the community. A specially designed ponding ring surrounds a roof drain conductor head on some buildings in Denver. The device slows runoff and is used for rainfall detention on the roof. In the layout of Melvina Ditch reservoir, a paved area prevents erosion at the inlet, and is used for recreational purposes. (Merritt-FIRL)
W74-09513

PITFALLS IN PARAMETER ESTIMATION FOR OXYGEN TRANSFER DATA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5A.
W74-09514

ALUMINUM PIT DOORS PROVIDE EASY ACCESS TO A RETENTION BASIN.
Water and Sewage Works, Vol 20, No 10, p 62-63, October, 1973.

Descriptors: *Storm drains, *Michigan, *Storm waters, Storage, Water storage, *Retention, Waste water treatment.
Identifiers: *Aluminum doors, *Narren(Mich).

The use of aluminum pit doors to provide easy access to the 50 million gallon underground stormwater retention basin in Warren, Michigan is discussed. The 42 heavy plate doors float on compression spring operators and automatically lock open, providing safety and easy handling. The five foot pit doors are completely watertight and provide a flush surface for walkover traffic. The channel frames trap surface water which is directed to a drywell. Doors are built for a minimum live load of 300 psf. The lock opens at 90 degrees, but can be released with one hand. The two large, special size roof scuttles were installed to permit installation and removal of large equipment. (Merritt-FIRL)
W74-09515

HOW TRIPLE SIPHON SOLVED SEWAGE TRANSFER ACROSS WELLAND RIVER,
L. Webster.
Engineering and Contract Record, Vol 88, No 10, p 54-55, October, 1973.

Descriptors: Rivers, *Canada, *Sanitary engineering, Treatment, Disposal, Plastics, *Plastic paper, Waste water treatment, *Siphons, *Sewers.
Identifiers: *Welland River(Ont), Niagara Falls(Ont).

The use of a novel triple siphon system across the Welland River on Ontario's Niagara Peninsula is described. Sanitary wastes originating on one side of the river are conveyed to the City of Niagara Falls pollution control plant across the river for treatment and disposal. Excavations were required for large manholes on each bank of the river, one to serve as an inlet structure, the other an outlet structure, for the siphons. A dewatering system was designed to secure the excavations against the hydrostatic pressure from the underlying silt layer. The use of polyethylene pipe for the siphons to effect the actual river crossing contributes to a substantial savings over a design calling for the underwater installation of more conventional materials. (Merritt-FIRL)
W74-09517

RURAL WATER SYSTEM DESIGNED FOR SUBURBAN USE,
For primary bibliographic entry see Field 5F.
W74-09519

MAGNETIC CLARIFIER.
Engineering News-Record, Vol 191, No 20, p 23, November 15, 1973.

Descriptors: *Massachusetts, Rivers, Treatment, *Recycling, Sludge, Mining, Iron, *Waste water treatment, Water reuse, Separation technique.
Identifiers: Magnetic clarifier, Apparatus, Magnetic separation, Boston(Mass), *Charles River(Mass), Bottom waters, *Iron filings.

The application of an instream magnetic separation process for cleaning the bottom waters of Boston's Charles River is described. The process has previously been used only in the mining and clay industries. It involves distributing very finely ground iron filings throughout water that has been pumped up through a suction device from the river bottom. Chemicals are added to coagulate the pollutants and iron filings, and to improved the electrolytic property of the water. The water is run through a high intensity electromagnetic field which attracts the solids. The separated material is again put through a magnetic field to recovery iron filings for reuse. The treated water is returned to the river while the sludge is temporarily stored in a barge. (Merritt-FIRL)
W74-09520

THE PHOSPHATE PRECIPITATION IN COMMUNAL WASTE WATERS (DIE PHOSPHATFAELLUNG IN KOMMUNALEM ABWASSER),
Knapsack A. G., Cologne (West Germany).
D. Gleisberg, J. Kandler, and G. Peantek.
Chemie-Ing.-Techn., Vol 45, No 20, p 1225-1226, 1973. 2 fig, 1 tab.

Descriptors: *Phosphates, Treatment, *Biochemical oxygen demand, *Chemical oxygen demand, Water pollution treatment, Treatment facilities, *Anabaena, Algae, *Waste water treatment, *Chemical precipitation, Inhibition.

The possibility of the chemical precipitation of phosphates and of the reduction of the BOD and COD values in municipal wastewater was studied at a wastewater treatment plant serving some 10,000 inhabitants. Precipitation, coprecipitation, and direct precipitation were studied. The precipitant used were aluminum sulfate containing 15 percent alumina, and ferric sulfate with about 43 percent ferric oxide. The precipitation was conducted in a mixing tank. The phosphate:Al and phosphate:iron ratios were set at 1:1.27 and 1:2.4, respectively. The pH value averaged 7.5. Precipitation of 80 percent of the orthophosphate ions in about ten seconds was determined. The efficiency of preprecipitation, coprecipitation, and direct precipitation in terms of phosphorus removal was 97-99 percent, 93-94 percent, and 97-98 percent, while mechanical-biological purification without precipitation has an efficiency of 10 percent only. The reduction in the BOD5 values was 93-99 percent for preprecipitation, 83-88 percent for coprecipitation, and 60-77 percent for direct precipitation, compared to a control value of 94 percent for the case of biological treatment. The corresponding figures for the reduction of the COD were 84-91 percent, 6074 percent, 55-59 percent, and 67 percent. Water samples taken after chemical precipitation of the phosphates, and incubated with Anabaena flos-aquae, considerably inhibited algal growth. (Takacs-FIRL)
W74-09521

MEMBRANE REGENERATION FOR WASTEWATER RECLAMATION USING REVERSE OSMOSIS,
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Program.
G. Belfort, F. E. Littman, and H. K. Bishop.
Water Research, Vol 7, No 11, p 1547-1559, 1973. 11 fig, 2 tab, 10 ref.

Descriptors: *Waste water treatment, *Reverse osmosis, *Water reuse, Engineering estimates, Design, Cost analysis, Operating costs, *Membranes.
Identifiers: Reverse osmosis membranes.

An increasingly viable source of water is waste water reclamation. Essential to the treatment process is demineralization. Recently, this task has been accomplished through reverse osmosis but this method is subject to potential plugging and simultaneous product flux-decline of the membranes. While two methods--periodic clearing and extensive pretreatment have been used to correct this problem, the third method described is presently economically feasible and allows for in situ replacement of cellulose acetate membranes. In the regenerable design unit the brine flows on the outside of the tank while the product, permeating the membrane covering, is collected in a reservoir. The degraded membrane is dissolved through pumping acetone into the unit. Coating solutions are then pumped into the unit to form the membrane and subsequent gelling is achieved by pumping ice water through the unit. To test the effectiveness of the methodology, the membrane replacement cycle was repeated six times with average water fluxes of 13 gal/sq ft/day and salt rejections of between 78-85%. Projected membrane costs are reduced from $4.06/sq ft for a 6-in dia module to 8 cent/sq ft for a 72-in dia module making the latter economically attractive. Tests on primary and secondary sewage are presented and design and cost computer parametrization are discussed. (Schroeder-Wisconsin)
W74-09554

SOME CONSERVATION PROBLEMS IN THE METAL-FINISHING INDUSTRY,
Bostock, Hill and Rigby, Birmingham (England).
R. K. Chalmers.
Chemistry and Industry, p 554-557, June 1973. 3 tab, 7 ref.

Descriptors: *Industrial wastes, *Recycling, *Metals, Flow, Effluents, *Waste water treatment, Chemical wastes, Water quality standards.
Identifiers: *Metal finishing wastes.

Losses of high quality process materials in the metal-finishing industry can be lessened by simple measures in the processes to reduce water consumption, effluent discharge volumes, and amounts of contaminants discharged to the drains as well as by water re-use measures. Methods for reducing water consumption are offered and a few examples are cited showing the effectiveness of these methods. Drag-in and drag-out from plating tanks can be minimized by air blasts, drainage techniques, wetting agents, and spray or intermittent rinses as a means of minimizing amounts of contaminants discharged to drains. Some companies involved in the use of large amounts of water are now aiming at 100% water recycle. Conditions necessary for re-use of effluents and approaches to treatment of effluents are listed and recommendations applicable to specific problems are discussed. Effluent standard determination is

mentioned and a list is included of reasonable limits in mg/l of contaminants in receiving waters suited for drinking supplies. (Jernigan-Vanderbilt)
W74-09577

MEMBRANE SCIENCE AND TECHNOLOGY.
Proceedings of Symposium held at the Columbus Laboratories of Battelle Memorial Institute, October 20-21, 1969, Columbus, Ohio: Plenum Press, New York, N.Y., 1970 (second printing 1973). 230 p, $27.00.

Descriptors: *Membranes, *Membrane processes, *Waste water treatment, *Water treatment, Filtration, Reverse osmosis, Water purification, Water reuse, Water pollution control.

A conference on membranes was held at the Columbus Laboratories of Battelle Memorial Institute in Columbus, Ohio, on October 20 and 21, 1969. Membranes are used to fractionate, purify, or concentrate primarily aqueous solutions containing small dissolved ionic and neutral solutes and much higher molecular weight compounds, including proteins, enzymes and viruses. These types of systems present problems which are quite different to those encountered in simple water recovery from sea or brackish water. Cake buildup on the membrane surface, clogging of pores, adsorption in and on the membrane, rheological limitations on the mass transfer of solute and solvent due to viscosity, shear, and non-Newtonian fluid effects, are examples. Many of the papers in this volume deal with or allude to these problems and provide useful insights into their causes and preventions. (See W74-09634 thru W74-09637)
W74-09633

LOW-PRESSURE ULTRAFILTRATION SYSTEMS FOR WASTEWATER CONTAMINANT REMOVAL,
Massachusetts Univ., Amherst., and Iowa Univ., Iowa City.
W. L. Short, R. T. Skrinde, and D. G. Newton, Jr.
In: Membrane Science and Technology; Proceedings of Symposium held at the Columbus Laboratories of Battelle Memorial Institute, October 20-21, 1969, Columbus, Ohio; Plenum Press, New York, N.Y., p 188-195, 1970 (second printing 1973). 3 fig, 2 tab, 16 ref.

Descriptors: *Waste water treatment, *Membrane processes, Filtration, Membranes, Reverse osmosis, Sewage treatment, Pulp wastes.

The membrane process of reverse osmosis, developed initially for use in desalination, is a promising method for treatment of wastewaters. The effect of surfactants was evaluated during low-pressure ultrafiltration of dilute raffinose solutions. The raffinose rejection is essentially independent of surfactant concentration and is, in fact, nearly constant at 80-85 percent. The surfactant, in addition to not altering the raffinose rejection, had no discernible effect on the permeate flux. (See also W74-09633) (Knapp-USGS)
W74-09634

INDUSTRIAL WASTE TREATMENT OPPORTUNITIES FOR REVERSE OSMOSIS,
Eastman Chemical Products, Inc., Kingsport, Tenn. Polymer Technology Div.; and Eastman Chemical Products, Inc., Kingsport, Tenn. Photographic Technology Div.
J. G. Mahoney, M. E. Rowley, and L. E. West.
In: Membrane Science and Technology; Proceedings of Symposium held at the Columbus Laboratories of Battelle Memorial Institute, October 20-21, 1969, Columbus, Ohio: Plenum Press, New York, N.Y, p 196-205, 1970 (second printing 1973). 6 fig, 4 tab, 1 ref.

Descriptors: *Reverse osmosis, *Membrane processes, *Industrial wastes, *Waste water treatment, *Water reuse, Reclaimed water, Byproducts, Chemical wastes, Water pollution control.

Processing industrial wastes by reverse osmosis or ultrafiltration can bring about process economies by recovery of the valuable materials dissolved in the waste stream, by recovery of high quality water for reuse, and by concentration of pollutants for disposal. (See also W74-09633) (Knapp-USGS)
W74-09635

ULTRAFILTRATION WATER TREATMENT,
Dorr-Oliver Inc., Stamford, Conn.
For primary bibliographic entry see Field 5F.
W74-09636

REVERSE OSMOSIS: APPLICATION TO POTATO-STARCH FACTORY WASTE EFFLUENTS,
Agricultural Research Service, Philadelphia, Pa. Eastern Utilities Research and Development Div.
W. L. Porter, J. Siciliano, S. Krulick, and E. G. Heisler.
In: Membrane Science and Technology; Proceedings of Symposium held at the Columbus Laboratories of Battelle Memorial Institute, October 20-21, 1969, Columbus, Ohio: Plenum Press, New York, N.Y., p 220-230, 1970 (second printing 1973). 3 fig, 5 tab, 6 ref.

Descriptors: *Waste water treatment, *Membrane processes, *Reverse osmosis, *Potatoes, *Food processing industry, Proteins, Water reuse, Byproducts.

Secondary wastes from potato-starch processing can be treated by reverse osmosis. This material contains protein, free amino acids, organic acids, sugars, inorganic ions, and other compounds. The output of this waste from a 30-ton-per-day starch plant is about 300 gpm or about 432,000 gallons per day. The solids content is about 0.5 to 1.0 percent, and it has a COD requirement of approximately 9000-14000 mg per liter. This is equivalent to a city of approximately 85,000 people, with respect to waste-disposal potential. The proteins and amino acids have been shown to contain more than adequate amounts of lysine and methionine for human and animal nutrition and, as such, have considerable value as additives to grain products. In a pilot test, the recovered water was pure enough for reuse. The best choice of the three types of membranes tested was the one of medium porosity. This conclusion was based upon the relationships between flux, retention of desirable waste-water constituents, and reduction of COD. (See also W74-09633) (Knapp-USGS)
W74-09637

URBANIZED AREAS SERVED BY SEWERS AND SEPTIC TANKS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W74-09639

OPTIMAL CONTROL OF FLOW IN COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
P. W. W. Bell.
Available from the National Technical Information Service as PB-233 668, $6.50 in paper copy, $1.45 in microfiche. Partial Completion Report, Metropolitan Water Intelligence Systems, Technical Report No 12, May, 1974. 232 p, 40 fig, 21 tab, 30 ref, 6 append. OWRR C-4172(No 9028)(1).

Descriptors: *Control systems, *Sewers, *Storm runoff, *Overflow, *Optimization, Water pollution control, Operations research, Storage, Detention, Reservoir operation, Mathematical models, Algorithms, Computer applications, Systems engineering, Automatic control, Nonlinear systems.

Identifiers: *Combined sewer systems, *Mathematical programming, Optimal control theory, Nonlinear programming.

The development of a suitable control logic for the real time control of flow in combined sewer systems is examined. The approach followed is based on continuous time optimal control theory. The combined sewer system is modelled as a series of interconnected reservoirs having both weir and orifice controls. The objective function chosen is that of minimizing weighted flow diversions from the system. The problem of numerical solution of the necessary conditions is examined and it is concluded that in general their solution is too cumbersome for practical use. An alternative control solution is proposed, based on operating rules derived from the common factors shown to exist in the previously examined solution forms. Results of application of this technique to systems of four reservoirs and ten reservoirs are presented. A further example is presented showing the effects of information errors on the true optimality of a computed control strategy. Finally, the necessary modifications to the necessary conditions for an optimal control in which there are time delays in the flow routing are presented. It appears that the approach outlined is a feasible solution to the problem of real time control of flow in combined sewers.
W74-09652

WASTEWATER RECLAMATION: SOCIO-ECONOMICS, TECHNOLOGY, AND PUBLIC ACCEPTANCE.
Ralph Stone and Company, Inc., Los Angeles, California.
Available from the National Technical Information Service as PB-233 675, $6.00 in paper copy, $1.45 in microfiche. Completion Report, May 1974. 302 p, 21 fig, 98 tab, 90 ref, 7 append. OWRR C-4030(No 9007)(1).

Descriptors: Reclamation, *Attitudes, *Economic feasibility, *Waste water treatment, Public health, *California, *Water reuse.
Identifiers: *Burbank(Calif).

The social, economic, technical and attitudinal aspects of wastewater reclamation were examined for various consumptive uses. Attitudes surveys of 100 randomly-selected residents in each of ten Southern California communities revealed consumer acceptance for non-body contact uses, neutral to accepting attitudes towards body contact uses, and neutral to rejecting attitudes for direct human consumption uses. The strongest public objection to wastewater reuse was psychological repugnance; other correlations of public attitudes were examined. Surveys of water resources public officials and experts and industrial management revealed attitudes towards reuse generally similar to the public's; officials tended to grossly overestimate public rejection of wastewater reclamation. Public health, water quality and other technical aspects of reclaiming wastewater were evaluated. Recommended treatment processes for various reuses were given. A cost-benefit model was presented for determining the overall socio-economic feasibility of reclaiming wastewater for a variety of alternative uses, taking into account differing local constraints likely to be encountered. The model was applied to the City of Burbank, California as a case study.
W74-09662

WASTE MANAGEMENT RESEARCH.
Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York. Graphics Management Corporation, Washington, D.C. (1972). 580 p.

Descriptors: *Farm wastes, *Waste disposal, Agriculture, Environment, Pollutants, *Waste treatment, *Waste storage, Legal aspects, *Regulations, Cattle, *Feed lots, Poultry, Hogs,

Agricultural runoff, Recycling, Pollution abatement.
Identifiers: *Waste management, Composting, Refeeding wastes, Pyrolysis.

Forty-nine papers were presented at the 1972 Cornell Waste Management Conference. These papers present varied aspects of waste management including: (1) legal and legislative regulations, (2) problems and alternatives for handling, treatment, and disposal systems for dairy, hog, beef, and poultry wastes, (3) water quality, and (4) utilization of wastes as a feed source. (See W74-09664 thru W74-09709) (Marquard-East Central)
W74-09663

AGRICULTURE IN THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
J. L. Buckley.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 1-7, (1972).

Descriptors: *Agriculture, *Environment, *Farm wastes, *Air pollution, *Water pollution, *Soil contamination, Industrial wastes, Municipal wastes, Feed lots, Research and development.

This symposium paper called for two basic accomplishments: (1) to find ways to halt agricultural pollution, and (2) to find uses for agricultural wastes. Agricultural pollution was defined, and the EPA's role in eliminating it discussed. (See also W74-09663) (Lynch-East Central)
W74-09664

ECONOMIC IMPACT OF AGRICULTURAL POLLUTION CONTROL PROGRAMS,
Federal Reserve Bank of Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W74-09665

PUBLIC RELATIONS ASPECTS OF AGRICULTURAL WASTE MANAGEMENT,
For primary bibliographic entry see Field 5G.
W74-09666

IMPLICATIONS OF THE PERMIT PROGRAM IN THE POULTRY AND ANIMAL FEEDING INDUSTRY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5G.
W74-09667

APPLICATION OF IOWA'S WATER POLLUTION CONTROL LAW TO LIVESTOCK OPERATIONS,
Iowa State Dept. of Health, Des Moines.
For primary bibliographic entry see Field 5G.
W74-09668

A REVIEW OF PUBLIC AND PRIVATE LIVESTOCK WASTE REGULATIONS,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 5G.
W74-09669

IMPLICATIONS OF STATE ENVIRONMENTAL LEGISLATION ON LIVESTOCK WASTE MANAGEMENT,
Economic Research Service, Washington, D.C. Farm Production Economics Div.
For primary bibliographic entry see Field 5G.
W74-09670

POTENTIAL CITIZEN INITIATED LEGAL ACTION AGAINST AGRICULTURAL POLLUTION,
West Virginia Univ., Morgantown. Div. of Resource Management.
For primary bibliographic entry see Field 5G.
W74-09671

DAIRY FARMER CONCERNS OF LAWS AND REGULATIONS AFFECTING ANIMAL WASTE MANAGEMENT,
National Milk Producers Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-09672

PYROLYSIS AS A METHOD OF DISPOSAL OF CATTLE FEEDLOT WASTES,
Midwest Research Inst., Kansas City, Mo.
W. Garner, C. E. Bricker, T. L. Ferguson, C. J. W. Wiegand, and A. D. McElroy.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 101-123 (1972). 7 fig, 5 tab, 10 ref.

Descriptors: *Farm wastes, *Waste disposal, *Feed lots, *Cattle, *Cost analysis, Cellulose, Lignin, Differential thermal analysis.
Identifiers: *Pyrolysis, Hemicellulose, Thermogravimetric analysis, Organic fractions.

A program was conducted to determine the economic feasibility of pyrolyzing feedlot wastes. Background theory on pyrolysis of cellulose, hemicellulose and lignin, and wood is given. The pyrolysis process is described and test results are given. Composition of noncondensables, elemental analyses, material and energy balance, and economic evaluation of a pyrolyzer for manure from a 40,000 head beef cattle feedlot are given. The conclusion was that pyrolysis of feedlot wastes was uneconomical in relation to simple incineration because cost of equipment to separate potential marketable material was not offset by the market value of the materials. (See also W74-09663) (Marquard-East Central)
W74-09673

DAIRY MANURE WASTE HANDLING SYSTEMS,
A. Grimm.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 125-144 (1972). 1 fig, 3 tab, 7 ref.

Descriptors: *Dairy industry, *Waste disposal, *Waste treatment, Aeration, Activated sludge, Incineration, Cattle, *California, *Farm wastes.
Identifiers: Dairy manure, *Waste handling systems, Centralized dairies, Decentralized dairies, Dirt corrals, Paved corrals, Direct disposal, Dewater solids, Compost, Liquid flush, Oxidation ditch, Dairymen's Fertilizer Cooperative, Pyrolysis, Southern California, Cerritos, California.

Because of complete urbanization of such areas as Cerritos, California, a program was initiated in southern California to study and demonstrate improved methods of handling raw manures at individual dairies and feedlots in highly populated areas. Individual systems costs are presented. Evaluations were made for ten decentralized individual dairy waste handling systems: Four for a dirt corral dairy and six for a paved corral dairy. Eight centralized, regional dairy waste handling systems were analyzed. A comparison is presented of environmental effects of waste handling systems and system operating cost. Conclusions were: (1) disposal of manure from each decentralized dairy should be accomplished in the most economical manner with the least detrimental environmental effect, and (2) in view of a diminishing number of dairies, construction and operation of a centralized waste disposal plant did not appear justified in the Cerritos area. (See also W74-09663) (Marquard-East Central)
W74-09674

AERATION RATES FOR RAPID COMPOSTING OF DAIRY MANURE,
G. B. Willson, and J. W. Hummel.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 145-158 (1972). 12 fig, 2 tab, 9 ref.

Descriptors: *Dairy industry, *Farm wastes, Chemical oxygen demand, Nitrates, Ammonia, *Waste treatment, *Aeration.
Identifiers: *Composting, Aeration rates, Bench composter, Bin composter, Mechanized channel, Oxygen consumption rate.

Studies were undertaken to develop design criteria for composting operations. Bench composters, bin composters, and a mechanized channel were the three methods used for development of aeration rates. A generalized curve was developed showing the effects of aeration on temperature and rate of oxygen consumption at any one time during the process. Aeration rates should vary in the process in the following sequence: (1) during warmup stage, aeration should be applied at increasing rates; (2) when thermophilic temperature is reached the aeration rate should be increased to the top of the temperature limit; and (3) as the level of activity decreases the rate of aeration should be reduced to prevent cooling. (See also W74-09663) (Marquard-East Central)
W74-09675

WINDROW COMPOSTING OF SWINE WASTES,
Cornell Univ., Ithaca, N.Y.
J. H. Martin, Jr., M. Decker, Jr., and K. C. Das.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 159-172 (1972). 10 fig, 5 tab, 7 ref.

Descriptors: *Hogs, *Waste treatment, Hydrogen ion concentration, *Farm wastes.
Identifiers: *Composting, *Swine wastes, Windrow, Thermophilic environment, Adulteration.

A study was performed to determine the feasibility of composting swine wastes. Criteria for evaluation were control of odors, time required for stabilization, volume reduction, and characteristics of the end product. Evaluation of the composting process was accomplished in two phases: (1) windrow formation creating aerobic conditions conducive to thermophilic activity and (2) maintenance of conditions for rapid stabilization. The findings were: (1) a direct correlation was observed between odor control and development of thermophilic environment; (2) increasing the turning frequency had a significant effect on the composting process; (3) adulteration of the material was successful in reducing the time before odors were controlled and minimizing time for completion when straw was used; (4) volume reduction and final material were satisfactory, and (5) composting can be a satisfactory method for treating swine manure and provides an alternative to liquid systems. (See also W74-09663) (Marquard-East Central)
W74-09676

REDUCTION IN MOISTURE AND DAILY REMOVAL OF WASTES FROM CAGED LAYING HENS,
West Virginia Univ., Morgantown.
A. D. Longhouse.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 173-185 (1972). 9 fig, 6 tab.

Descriptors: *Poultry, *Farm wastes, *Waste disposal, Ammonia, *Waste treatment, Odor, Forced drying.
Identifiers: Caged laying hens, Moisture reduction, Vertically tiered cages, Dryer conveyor, Dropping boards, Scraper.

Research objectives were to remove manure daily from laying hens in vertically tiered cages and to begin moisture removal promptly, thus preventing odor development (especially of ammonia) and restricting vectors. The research facility was equipped with a dryer-conveyor, dropping boards, a scraper mechanism, and an automatic control for solenoid steam valve. Construction design is illustrated. Results of a five-day test are tabulated. The research, at this time, indicates that it is possible to eliminate odors and flies in a poultry house when the manure is removed at least once daily, thus making it possible to increase the bird population 25 to 100 percent - thereby paying for added mechanization. (See also W74-09663) (Marquard-East Central)
W74-09677

UNDERCAGE DRYING OF LAYING HEN MANURE,
Cornell Univ., Ithaca, N.Y.
A. T. Sobel.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 187-200 (1972). 12 fig, 2 tab, 3 ref.

Descriptors: *Forced drying, *Farm wastes, *Poultry, Attractants, *Waste disposal, Odor, Particle size, Particle shape, Temperature, *Waste treatment.
Identifiers: Undercage drying, Laying hen manure, Fins, Screens, Slot outlets, Air velocity, High-rise laying house, Bird concentration.

Two systems for undercage drying of chicken manure were investigated. The first system employed mechanical devices and no forced air. Test results indicated metal fins placed at angles beneath cages offer more efficient drying than mesh screen. Percentage results of various angles are listed. The second system utilized forced air drying in bird rooms with slot outlets and a high rise laying house. This was the only system studied on a full size field operation. An average drying curve for undercage drying with forced air and slot outlets and a summary of moisture contents obtained for various undercage drying systems are presented. Observations indicate (1) the high-rise house presented the largest range of moisture contents, (2) shallow bed system (forced air) presented the smallest range of moisture, and (3) all systems removed moisture to moisture contents below 60 percent. (See also W74-09663) (Marquard-East Central)
W74-09678

STORAGE OF MANURE SOLIDS BY FORMING SOIL-MANURE PELLETS,
Iowa State Univ., Ames.
R. D. Larson, T. E. Hazen, and J. R. Miner.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 201-210 (1972). 5 fig, 5 tab, 5 ref.

Descriptors: Hydraulic transportation, *Farm wastes, *Waste storage, Moisture content, Physical properties, Hydrogen ion concentration, Nitrogen, Carbon dioxide, Ammonia, *Waste treatment, Dewatering.
Identifiers: *Soil-manure pellets, Hydrated lime, Webster silty clay loam, Volitalization.

Moisture content, pH effects and nitrogen/CO2 evolution in the pelleting process of animal manure are described. Soil and lime are added to manure solids to help produce pellets. Soil is used as a dewatering and binding agent to control moisture content and lime is used to increase pH. Nitrogen/CO2 evolution is tested by 5 and 10% lime treatments. Conclusions are: (1) Addition of lime increases ammonia loss from a soil, lime and manure mixture; the rate of evolution increases significantly above pH 11. Moisture content does not greatly effect rate of evolution. (2) Biological activity, represented by carbon volatilization increases with the addition of 2.5% d.b. hydrated lime. Further lime additions decrease activity. At the 10% lime level, growth is arrested. Little or no growth occurs above pH 9. In most treatments, moisture-content increases were accompanied by marginal increases in carbon-dioxide evolution. (3) Manure solids exhibit a buffering capacity. The solids have an ability to retard pH increases with increasing lime contents. A pH range from 9 to 11 would be desirable in order to mutually minimize ammonia and carbon evolution. (See also W74-09663) (Marquard-East Central)
W74-09679

CHEMICAL STUDIES OF SOLIDS, RUNOFF, SOIL PROFILE AND GROUNDWATER FROM BEEF CATTLE FEEDLOTS AT MEAD, NEBRASKA,
For primary bibliographic entry see Field 5B.
W74-09680

BEEF BARNLOT RUNOFF AND STREAM WATER QUALITY,
Ohio Agricultural Research and Development Center, Worster.
For primary bibliographic entry see Field 5B.
W74-09681

AUTOMATED HYDRAULIC WASTE-HANDLING SYSTEM FOR A 700-HEAD SWINE FACILITY USING RECIRCULATED WATER,
Iowa State Univ., Ames.
J. K. Koelliker, J. R. Miner, T. E. Hazen, H. L. Person, and R. J. Smith.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 249-261 (1972). 8 fig, 1 tab, 6 ref.

Descriptors: *Hogs, *Recirculated water, *Farm wastes, *Waste storage, *Waste disposal, Irrigation, Estimated costs, *Iowa, *Waste water treatment, Water reuse.
Identifiers: Automated hydraulic waste-handling system, Flush tanks, Sewer lines, Anaerobic lagoon, Return water system, Slatted floors.

A swine waste handling system is described that for four years has operated with little attention, no handling of manure, low odors, and no effluent discharge into streams. The system uses an enclosed building in which swine waste is deposited into gutters. Flush tanks automatically flush the water into sewer lines and then to an anaerobic lagoon. From here some waste goes into the irrigation system for land disposal and lagoon effluent is returned to the flush tanks. Investment in the entire manure management system is estimated at $10-$15 per hog capacity. Detailed description and costs of the system are given. (See also W74-09663) (Marquard-East Central)
W74-09682

OPERATIONAL PROBLEMS OF PORK PRODUCTION RELATED TO ENVIRONMENTAL QUALITY,
A. E. Gehlbach.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 263-265 (1972).

Descriptors: *Hogs, *Farm wastes, *Waste disposal, Confinement pens, Oxidation lagoons, Lagoons, *Waste water treatment.
Identifiers: *Environmental quality, Operational problems, *Soil injection, Pasture system, Collection pits.

A comparison is made of two pork production systems - the pasture system and the confinement system. An operational problem of the pasture system is that heavy rains wash runoff into streams. The confinement system can prevent this and can dispose of waste in these ways: (1) collection pits, (2) oxidation ditches, (3) lagoons. Problems of these are costs and inability to use them year round. Gehlbach Swine Farms uses soil injection to prevent runoff and odor; however, research is needed to solve these waste disposal problems: (1) find limits of animal waste applications to land, (2) prevent odor from swine buildings and (3) find proper operating procedures for lagoons. (See also W74-09663) (Marquard-East Central)
W74-09683

TREATMENT OF SWINE WASTES,
L. R. Schuster.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 267-270 (1972).

Descriptors: *Hogs, *Farm wastes, *Waste treatment, Confinement pens, Poultry, Biochemical oxygen demand, Costs, *Aeration.
Identifiers: Tank-aerator.

The swine aerator system was chosen as a means of waste treatment for the following reasons: (1) Closed loop with zero runoff, (2) Adaptability to existing facility, (3) Ready accessibility for maintenance, (4) Ease of operations. Tank design and aeration rates are given for a 100 sow operation. Water area of the system is 18x38x10 ft. Waste containing a five day biochemical oxygen demand of 33,000 mg/l and an oxygen uptake rate of 43 mg/l/hr. requires transfer of 21.5 lbs of oxygen per hour at 20 degrees centigrade. Pumps must be capable of pumping at least 635,000 gal/hr., or the equivalent of turning over the tanks content once every 4.7 minutes. Costs and savings through use of such a system are discussed. (See also W74-09663) (Marquard-East Central)
W74-09684

AN EVALUATION OF THREE HYDRAULIC MANURE TRANSPORT TREATMENT SYSTEMS, INCLUDING A ROTATING BIOLOGICAL CONTACTOR, LAGOONS AND SURFACE AERATORS,
Iowa State Univ., Ames.
H. L. Person, and J. R. Miner.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 271-288 (1972). 5 fig, 9 tab, 1 ref.

Descriptors: *Hogs, *Farm wastes, *Waste treatment, *Waste water treatment, Lagoons, Confinement pens, Nitrogen, Ammonia, Rotating biological contactor, Chemical oxygen demand, Biochemical oxygen demand, Effluent, Iowa.
Identifiers: *Hydraulic manure transport systems, Anaerobic lagoon, Aeration basin, Recycled water, Flushing gutters, Surface aerators, Bilsland Memorial Research Station.

Three different waste treatment systems that use flushing gutters and recycled treated waste waters for cleaning are reported. System 1 uses flushing gutters and an aeration basin; system 2 uses flushing gutters, an anaerobic lagoon and an aeration basin; and system 3 uses flushing gutters, an anaerobic lagoon and a rotating biological contactor. Each system is diagramed and specific details and dimensions are given. Effectiveness of the three systems in terms of effluent control is summarized. It was found that (1) discharging effluent down flushing gutters was an effective means of removing manure from swine buildings, (2) treated effleunt did not inhibit normal swine growth, (3) recycled wastes did not cause excessive odor problems, (4) the effluent from the RBC system and lagoon, aeration-basin system presented a few

pumping problems, and (5) the aeration-basin effluent contained more solids and had clogged return lines more frequently. (See also W74-09663) (Marquard-East Central)
W74-09685

DRYING POULTRY MANURE AND REFEEDING THE END PRODUCT,
J. F. Bergdoll.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 289-293 (1972).

Descriptors: *Poultry, *Farm wastes, *Recycling, Nitrogen, Costs, Nutrients, Odor, Fertilizers, *Indiana, *Drying, *Waste treatment.
Identifiers: Refeeding, Dried poultry manure.

Berry Best Egg Company's program for drying poultry manure into a feed is reported. The manure is dried to a 10-15% moisture content. No odor is reported when 10% level is reached; however, from the 12-15% moisture level, there is a slight smell. Cost for a dryer runs from $22,000 to $70,000 and total operational costs run from $15 to $35 per ton. Nutrient Value/Nitrogen is highest when manure is dried daily. Optimum level for waste in a feed ration is 10 to 15%; however, it is recommended that birds should start eating a ration at eight weeks of age and work up to a 30% level. Egg production results are given. (See also W74-09663) (Marquard-East Central)
W74-09686

THE EFFECTS OF CONTINUOUS RECYCLING AND STORAGE ON NUTRIENT QUALITY OF DEHYDRATED POULTRY WASTE (DPW),
Michigan State Univ., East Lansing.
C. J. Flegal, C. C. Sheppard, and D. A. Dorn.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 295-300 (1972). 5 tab, 5 ref.

Descriptors: *Poultry, *Farm wastes, *Waste storage, *Nutrients, Calcium, Phosphorus, Nitrogen, *Recycling, *Waste treatment.
Identifiers: Continuous recycling, Dehydrated poultry wastes, Crude protein.

One experiment was conducted to determine the influence of poultry waste storage time on the nutrient quality of dried poultry wastes. Another experiment tested what continuous recycling does to dried poultry waste nutrient quality. In the first experiment, droppings were collected and stored prior to drying from periods ranging from 1 to 90 days. In general, when the material was held for longer than 28 days, crude protein content went down. In experiment 2, pullets were fed rations for 412 days. The diets containing DPW were continuously recycled. At the completion of 31 cycles, the proximate analyses of the DPW from the birds fed the continually recycled DPW were quite similar to prior results. However, both calcium and phosphorus were slightly higher than DPW from hens fed a standard cage laying ration. Hen housed egg production of the birds fed the 12.5 percent DPW diet was slightly higher than the hen housed egg production of the other birds. Birds fed the diet containing 25 percent DPW consumed the most feed. Mortality of the birds fed the three diets ranged from 6.9 percent to 7.9 percent. (See also W74-09663) (Marquard-East Central)
W74-09687

EVALUATION OF DEHYDRATED POULTRY MANURE AS A POTENTIAL POULTRY FEED INGREDIENT,
Cornell Univ., Ithaca, N.Y.
M. C. Nesheim.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 301-309 (1972). 7 tab, 6 ref.

Descriptors: *Poultry, *Farm wastes, *Feeds, *Recycling, Evaluation, Economics, Amino acids, Phosphorus, *Waste treatment.
Identifiers: Refeeding, Dehydrated poultry manure, Metabolizable energy, Egg production, Feed consumption.

Experiments were made to evaluate poultry waste as a poultry feed ingredient. The metabolizable energy content of the poultry waste was considered the best single overall measure of its potential value as a feed ingredient. Test hens were fed computer formulated rations of which diets 1, 2, and 4 were of low energy content while diet 3 was a typical commercial energy diet. Diets 1 and 4 had 22.5% poultry waste as an ingredient of their rations. Results revealed that egg production was high for all four diets; however, hens on diets 1, 2, and 4 ate more than those on diet 3. There was also a marked increase in excreta dry matter for these hens. This indicated that only a portion of the manure was actually lost in recycling. The computer analysis indicated that poultry waste would be used as a preferred source of phosphorus in the ration until it reached a cost of $26.00 a ton with the feed ingredients used. Its high phosphorus content along with the associated amino acids and energy made it a preferred source of phosphorus in the ration compared to meat meal and decalcium phosphate. (See also W74-09663) (Marquard-East Central)
W74-09688

OPERATIONAL PROBLEMS OF POULTRY PRODUCTION RELATED TO ENVIRONMENTAL QUALITY,
H. J. Kreher.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 311-316 (1972).

Descriptors: *Waste disposal, *Poultry, *Air pollution, *Odor, *Legal aspects, Technology, Ozone, *New York, *Waste water treatment.
Identifiers: Operational problems, Environmental quality, Liquid manure spreader, Soil injection.

Waste disposal is the main operational problem of Kreher Poultry Farms, a 60,000 hen poultry farm in New York. When land disposal of liquid manure became objectionable to a nearby population, ozone treatment was used to reduce odors. Due to maintenance breakdowns, the odors persisted and the farm owners were taken to court. The owners were faced with a $200 settlement for their violations. These owners feel that this was an unfair judgement and that there is a desperate need for an objective third party - an agriculture industry panel made up of people acquainted with agricultural problems and agricultural research. Such a council could give sound recommendations to farmers in trouble. (See also W74-09663) (Marquard-East Central)
W74-09689

AUTOMATED HANDLING AND TREATMENT OF SWINE WASTES,
Ohio State Univ., Columbus.
E. P. Taiganides, and R. K. White.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 331-339 (1972). 12 fig.

Descriptors: *Hogs, *Farm wastes, *Waste water treatment, *Oxidation lagoons, Odor, Automation.
Identifiers: *Automated handling, Flushing gutters, Recycled waste water, Siphon tanks.

A plant was constructed on Botkins Feed and Grain Company Research Farm, Botkins, Ohio, in order to study the feasibility of automatically removing swine wastes, treating them, and recycling treated effluent back to the building to flush out further wastes. The plant operated as follows. A tank located at the end of the gutter was filled with water which was siphoned onto the gutter. The flushing water carried the dung defecated on the gutter to a sump from where the waste water was pumped onto a stainless steel screen. At the screen, the solids were separated from the liquids. Liquids were discharged into the oxidation ditch, clarified, and the supernatant from the final clarifier was pumped back into the siphon tanks in the animal building. Meanwhile the solids separated by the screen were aerobically digested, stored, and pumped on crop land. After twenty weeks of operation the automated removal of waste was working extremely well and odor control was good, but the oxidation ditch was malfunctioning and foaming. At the time of this report, it was hoped that the system would be monitored two more years and that procedures would be developed to make the plant operate optimally at all times. (See also W74-09663) (Marquard-East Central)
W74-09690

EVALUATION OF SWINE WASTE TREATMENT ALTERNATIVES,
North Carolina State Univ., Raleigh.
F. J. Humenik, R. W. Skaggs, C. R. Willey, and D. Huisingh.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 341-352, (1972). 1 fig, 11 tab, 6 ref.

Descriptors: *Hogs, *Farm wastes, *Waste water treatment, *Evaluation, *Waste disposal, Nitrogen, Chemical oxygen demand, Phosphorus, Heavy metals.
Identifiers: *Land disposal, Unaerated lagoons, Application rates, Cecil sandy loam, Norfolk sandy loam.

The treatment of swine waste by a single unaerated lagoon, the treatment of swine waste by an unaerated series lagoon system, and data for land disposal of effluent from a single unaerated lagoon are described. The experiment revealed that an unaerated series lagoon can handle twice the number of animals that a single aerated lagoon can take care of and there is no increase in odor. Specific conclusions were: (1) Major constraints in using lagoon systems in the Southeast are the disposal of excess liquid and the potential of odor and excess leakage. (2) A conservative estimate of allowable nitrogen loading when using land disposal of wastes in the Southeast appears to be 15 lb/acre/week for Cecil sandy loam and 10 lb/acre/week for Norfolk sandy loam. (3) Heavy metal feed additives can pose an environmental and health hazard, i.e. the copper content of the soil-plant disposal system may approach levels that poison the soil and/or are toxic for sheep and other animals. However, lagoons can be utilized as a copper trap prior to land disposal. (See also W74-09663) (Marquard-East Central)
W74-09691

DEVELOPMENT OF A SYSTEM AND A METHOD FOR THE TREATMENT OF RUNOFF FROM CATTLE HOLDING AREAS,
Kappe Associates, Inc., Rockville, Md.
D. S. Kappe.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 353-363, (1972). 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Farm wastes, *Agricultural runoff, Waste treatment, *Waste disposal, Cattle, Dairies, *Confinement pens, Aerobic treatment, Anaerobic conditions, Sludge, Hydrogen ion concentration, Chemical properties, Economics, Maryland.
Identifiers: *Waste management research, *Aeration tank.

Kappe Associates Inc. and J. L. Mills Brooklawn Dairy Farm have completed construction of a

dairy farm wastes treatment system. A description is given of the project site, the experimental treatment system, and the studies that are to be made. The treatment system consists of a concrete flow metering box; an aerated grit chamber; a dual section aeration tank with a hopper bottom; a chlorine contact tank, a pump and piping system that enable treated and chlorinated wastewater to be used for washing down the treatment facility and flushing the holding area; a small building, which houses two blowers for supplying air to the aeration tank, the chlorinator for the facility, the treatment system electrical control panel; an air flow meter for measuring the air flow to the aeration tanks; a wastewater flow recorder; other mechanical equipment; and the project site laboratory. The system was designed essentially to utilize the extended aeration modification of the activated sludge waste treatment process and to operate on a 'fill-and-draw' basis. The treatment methods to be studied were based on biological processes or combination of biological processes. (See also W74-09663) (Marquard-East Central)
W74-09692

EVALUATION OF BEEF WASTE MANAGEMENT ALTERNATIVES,
Oklahoma State Univ., Stillwater.
A. R. Butchbaker, J. E. Garton, G. W. A. Mahoney, and M. D. Paine.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 365-384, (1972). 7 fig, 6 tab, 21 ref.

Descriptors: *Cattle, *Farm wastes, *Waste water treatment, *Waste disposal, *Waste storage, Climates, Slurries, Costs, Agricultural runoff, Solid wastes, Farm lagoons, Legal aspects.
Identifiers: *Waste management alternatives, *Confinement buildings, Open feedlots, Site selection.

Waste management design alternatives are outlined for both open and housed feedlot feeding facilities. Among the major conclusions are: (1) No treatment system for liquid feedlot wastes produces an effluent suitable for discharge to a stream. (2) Areas where moisture deficit is greater than 10 inches have high potential for using evaporation for ultimate disposal of liquid wastes. (3) Paving open feedlots reduces pen surface area and runoff control structure sizes to about one-third of the area and sizes required for unpaved feedlots. (4) Confinement buildings offer a high potential for pollution control. Capital costs are higher than for open feedlots, but land areas are reduced, rainfall runoff structures are unnecessary and wastes may be removed either as a semi-solid or as a slurry. (5) A slurry hauling system utilizing soil injection for handling liquid wastes from storage pits provides an optimum system for abatement of odors and water pollution, but is more expensive and slower than surface spreading. (6) A manure irrigation system for pumping a slurry or wastewater for field application costs about one-half as much as mechanically hauling and spreading a slurry within one-half mile of the feeding facilities. (7) Ultimate disposal of feedlot waste on agricultural land should be encouraged. (See also W74-09663) (Marquard-East Central)
W74-09693

CHARACTERISTICS OF WASTES FROM SOUTHWEST BEEF CATTLE FEEDLOTS,
Texas Tech Univ., Lubbock.
D. M. Wells, G. F. Meenaghan, R. C. Albin, E. A. Coleman, and W. Grub.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 385-404, (1972). 5 fig, 17 tab.

Descriptors: *Feed lots, *Farm wastes, *Southwest U.S., *Waste water treatment, *Waste disposal, Feeds, Slopes, Semiarid climates, Texas.
Identifiers: *Concrete-surfaced feedlots, *Dirt-surfaced feedlots, Waste characteristics, Composting.

Studies conducted on concrete-surfaced feedlots and on dirt-surfaced feedlots with varying degrees of slope yielded the following conclusions: (1) Pollutant concentrations of runoff are in a range of one to more than two orders of magnitude higher than concentrations found in untreated municipal sewage. (2) Treatment of runoff from Southwestern cattle feedlots is infeasible. (3) Concentrations of pollutants in runoff resulting from precipitation on concrete-surfaced lots are two to four times greater than corresponding concentrations from dirt-surfaced lots. (4) The quantity of solid waste accumulating on the feedlot floor is a direct function of the fraction of roughage in the finishing ration. (5) The fraction of incident precipitation running off concrete lots is twice the fraction running off dirt-surfaced lots. (6) Stocking rates above 40 square feet per animal on concrete lots do not enhance animal performance. (7) Limited feeding trials utilizing a roof to eliminate runoff had no effect on cattle performance. (8) Increasing slope of concrete feedlots from 7 1/2 to 15 percent makes lots virtually self-cleaning. (9) Aerobic composting of solid wastes is technologically feasible regardless of the type of operation. (10) Extreme caution must be exercised in application of feedlot runoff to agricultural crops. (See also W74-09663) (Marquard-East Central)
W74-09694

INITIAL OBSERVATIONS OF SEVERAL MEDIUM SIZED BARRIERED LANDSCAPE WATER RENOVATION SYSTEMS FOR ANIMAL WASTES,
Michigan State Univ., East Lansing.
A. E. Erickson, J. M. Tiedje, B. G. Ellis, and C. M. Hansen.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 405-410, (1972). 1 fig, 2 tab, 2 ref.

Descriptors: *Waste water treatment, *Waste disposal, *Farm wastes, *Water pollution, *Soil contamination, *Nitrogen, *Phosphorus, Denitrification, Carbon, Livestock, Hogs, Nitrates, Effluent, Aquifer.
Identifiers: Barriered Landscape Water Renovation System(BLWRS).

Adsorption and filtering action of soils can be used to renovate waste water, but the expense of land and its management as well as land availability in many places has forced the intensive spreading of wastes on limited acreages with the possible pollution of water resources. Because there is a need for a method of renovation which is more efficient, doesn't require such large land areas, and is not as expensive as conventional sewage treatment and disposal, BLWRS (Barriered Landscape Water Renovation System) has been developed. It consists of a limestone or slag covered mound of soil underlain by an impervious water barrier. BLWRS's method is relatively inexpensive to construct, requires a minimum of maintenance, requires a smaller area than is needed for irrigation spreading systems, and removes large amounts of the nitrogen, carbon and most of the phosphate from the local environment. Tests are too incomplete for BLWRS's to be used commercially, but so far its nitrogen and phosphate removal capability has been as high as 99% for animal wastes. (See also W74-09663) (Marquard-East Central)
W74-09695

REMOVAL OF PHOSPHORUS FROM LIQUID ANIMAL MANURE WASTES,
Cornell Univ., Ithaca, N.Y.
R. C. Loehr.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 411-427, (1972). 4 fig, 2 tab, 4 ref.

Descriptors: *Farm wastes, *Liquid wastes, *Phosphorus, *Waste water treatment, *Waste disposal, Alum, Hydrogen ion concentration, Poultry, Ducks(Domestic), Cattle, *New York.
Identifiers: Chemical removal, Alum, Ferric chloride.

Results are presented of detailed laboratory studies to remove phosphorus from duck, poultry, and dairy manure wastewaters and the feasibility of such removal is discussed. The studies investigated the effect of phosphorus concentrations, pH control, different coagulants and wastewater source. The three chemicals used in the phosphorus removal experiments were: alum - AL2(SO4)3; lime - CaO; and ferric chloride - FeCL36H2O. Actual comparison of the three chemicals was difficult since they were used in wastewaters of different characteristics and chemical demand. Chemical choice was determined by required dosage, chemical cost, and the costs of ultimate solids disposal. The alum requirements were less than those of lime for most poultry manure wastewaters; lime requirements were less for duck wastewater. Controlled land disposal should be considered a high priority method for phosphorus control from animal wastewaters because it is more amenable to normal animal production operations, avoids the need for chemical control and treatment plant operation, and eliminates additional problems of chemical costs and sludge production handling and disposal. (See also W74-09663) (Marquard-East Central)
W74-09696

CONTRIBUTION OF ANIMAL WASTE TO NITRATE NITROGEN IN SOIL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5B.
W74-09697

HEAVY MANURE APPLICATIONS: BENEFIT OR WASTE,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
M. E. Weeks, M. E. Hill, S. Karczmarczyk, and A. Blackmer.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 441-447, (1972). 6 tab, 4 ref.

Descriptors: *Farm wastes, *Waste disposal, *Rates of application, Nitrogen, Phosphorus, Salts, Connecticut, Massachusetts, *Corn(Field), *Waste treatment, Nitrates.
Identifiers: Agawam sandy loam, Hadley sandy loam, Chlorides.

A study was started to determine the effects of high rates of manure on the growth and yield of corn crops and on chemical and physical change in light textured soils. Three experimental sites with sandy loam soils were used. After two years of experimenting, the following was revealed: (1) Large manure applications on well-drained sandy loam soils should not adversely affect crop growth or yield. (2) Manure applications have a favorable effect on general tilth and workability of soil. (3) Nitrates, chlorides and other salts move through the soil profile at all levels of application, though during the growing season a crop of corn would utilize much of the nutrients as they become available, probably as high as 42 tons per acre. (4) Leaching would occur mainly before the crop is established and after it is removed. (5) Annual applications of manure for purposes of disposal on crop land should be made only after due consideration is given to location and total amount of area covered. The crops themselves were not analyzed for nitrate content. (See also W74-09663) (Marquard-East Central)
W74-09698

EFFECTS OF SOLID BEEF FEEDLOT WASTES ON SOIL CONDITIONS AND PLANT GROWTH,
Kansas State Univ., Manhattan.
L. S. Murphy, G. W. Wallingford, W. L. Powers, and H. L. Manges.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 449-464, (1972). 15 fig, 2 tab, 12 ref.

Descriptors: *Feed lots, *Farm wastes, *Waste disposal, *Nitrogen, *Nitrates, *Phosphorus, Rates of application, Nutrient removal, Plant growth, Soil chemical properties, Ions, Sodium, Potassium, Cattle, *Kansas, Waste treatment.
Identifiers: Electrical conductivity, Saturation extract conductivity, Greensburg silty clay loam, Silage yields.

Results of a two-year study indicate that large applications of solid beef feedlot manure can depress yields of corn silage. Silage yields were found to have a quadratic relationship to manure applications. Maximum yields were realized between 225 and 300 MT/ha. Depressed yields were due to accumulation of salts from manures. Electrical conductivity of the soil saturation extract increased linearly with manure applications. Sodium, potassium, phosphorus, NO3 -N and nitrogen were found in large quantities in the soil; however, NO3 -N and nitrogen was not in large quantities of the corn silage, while phosphorus was. Results suggest that the detrimental effects of excessive manure application may be reversed by continued cropping and adequate water penetration of the soil. (See also W74-09663) (Marquard-East Central)
W74-09699

GRASS RESPONSE TO APPLICATIONS OF BEEF-CATTLE FEEDLOT RUNOFF,
M. B. Satterwhite, and C. B. Gilbertson.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 465-480, (1972). 3 fig, 7 tab, 27 ref.

Descriptors: *Feed lots, *Agricultural runoff, Chemical analysis, *Rates of application, *Grasses, Soil chemical properties, Nutrients, Soil profiles, Cattle, *Nebraska, *Waste water treatment.
Identifiers: Orchard grass, Little bluestem, Switchgrass, Reed canarygrass, Big bluestem, Intermediate wheatgrass, Brome grass, Side-oats grama, Indiangrass.

Field and greenhouse investigations were initiated to determine the response to various kinds of grasses to applications of beef feedlot runoff. Chemical aspects of the runoff, grasses tested, grass production, protein content, and soil analyses are tabulated. It was found that yearly variation in runoff could lead to differences in grass response. Response could range from increased yields to death. Under controlled greenhouse conditions, grasses in order of decreasing response were: Orchard grass, Little bluestem, Switchgrass, Reed canarygrass, Big bluestem, Intermediate Wheatgrass, Brome grass, Side-Oats Grama, and Indiangrass. (See also W74-09663) (Marquard-East Central)
W74-09700

A STUDY OF CORN RESPONSE AND SOIL NITROGEN TRANSFORMATIONS UPON APPLICATION OF DIFFERENT RATES AND SOURCES OF CHICKEN MANURE,
Cornell Univ., Ithaca, N.Y.
K. MacMillan, T. W. Scott, and T. W. Bateman.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 481-494, (1972). 8 fig, 10 tab, 5 ref.

Descriptors: *Farm wastes, *Rates of application, *Nitrogen, Potassium poultry, Electrical conductance, Acidic soils, Salts, Hydrogen ion concentration, *New York, *Waste water treatment, *Corn(Field).
Identifiers: Chicken manure, Soil nitrogen transformation, Oxidation ditch manure, Diffused air manure.

A 37-day greenhouse experiment was initiated to (1) determine corn response when extremely different rates of treated manure sources were applied to two typical New York soils differing in pH and (2) determine soil nitrogen transformations under the above conditions. Raw manure was applied at rates 0, 75, 155, 310, and 620 micro gN/gm soil. All other sources (stored oxidation ditch manure, oxidation ditch manure, and diffused air manure) were applied at rates 0, 125, 250, 500, and 1000 micro gN/gm soil. It was concluded that: (1) high rates of manure applications did not result in excessive amounts of salts nor destroy the microbial population, (2) Luxury Nitrogen and potassium consumption resulted from the application of high rates of the manure sources studied, (3) In low pH soils the corn grew well; in high pH soils the effect of manure application was detrimental. This suggested that acid soils have the greatest potential for manure disposal and maximum crop efficiency. (See also W74-09663) (Marquard-East Central)
W74-09701

SURFACE RUNOFF NUTRIENT LOSSES FROM VARIOUS LAND DISPOSAL SYSTEMS FOR DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-09702

A STUDY OF FOAMING PROBLEMS IN AN OXIDATION DITCH TREATING SWINE WASTE,
Toronto Univ. (Ontario).
P. H. Jones, and N. K. Patni.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 503-515, (1972). 14 fig, 2 tab, 3 ref.

Descriptors: *Farm wastes, *Swine, *Oxidation lagoons, *Foaming, *Waste water treatment, Temperature, Hydrogen ion concentration, Suspended solids.
Identifiers: *Oxidation ditch, *Electronic foam sensor, Beloit-Passavant Rotor, Foam suppressants, Electrodes, Silicon controlled rectifier.

A study was made of the occurrence of foam and the factors affecting foam generation in a full-scale oxidation ditch used for treatment of daily wastes of approximately 400 swine. Foam formation was monitored daily for 211 days and temperature, dissolved oxygen, pH, suspended solids, etc. were measured. A rotor operated within the ditch to promote aeration. Breaking the foam with water spray proved unsatisfactory. By the 6th week, foaming was acute. The use of winter fuel oil and commercial foam depressants proved unsatisfactory. A five foot high wooden head-box was constructed downstream of the rotor to catch the foam, but proved to be not strong enough. After the winter freeze the ditch was restarted May-August, 1971. An electronic foam sensor was devised. When foam built up too much, the sensor caused the rotor to shutdown. A red warning light alerted farm personnel. 1-3 hours was allowed to let the foam subside. Then the rotor was manually restarted. The foam sensor operating in conjunction with the head-box completely eliminated foam spillovers. Little maintenance was required and the necessity of closely watching the foam was removed. (See also W74-09663) (Merryman-East Central)
W74-09703

TREATMENT AND DISPOSAL OF SWINE WASTE,
T. J. Mulligan, and J. C. Hesler.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 517-536, (1972). 8 fig, 4 tab.

Descriptors: *Waste water treatment, *Waste disposal, *Farm wastes, *Hogs, Confinement pens, Feeds, Biochemical oxygen demand, Chemical oxygen demand, Foaming, Aerated lagoons, Anaerobic conditions, Odor.
Identifiers: Swine, Refeeding.

Several treatment systems for swine wastes are reviewed. Specific studies are cited and formulas derived. Anaerobic lagoons and aerated lagoons reduce the organic contents of wastewater. Discharge of the treated settled effluent to surface waters after this type of treatment, however, is often unsatisfactory due to the nutrient content and color of the wastewater. Also, the remaining BOD, suspended solids, coliform, and salt content may be objectionable in certain receiving waters. Liquid wastewaters may be disposed of by spray irrigation or evaporation ponds. Each of these methods requires significant land area and may be accompanied by an odor problem. Wastes may be spread on the land or plowed and furrowed, but again there is a potential odor problem and large land area is required. Also, in cold climates the wastes would have to be stored until they could be deposited on the land. Wastes may be refed, but more research is needed. Many variables must be evaluated in determining ultimate treatment and disposal of animal waste. Imaginative approaches to the overall waste problem are needed. (See also W74-09663) (Merryman-East Central)
W74-09704

AEROBIC TREATMENT OF SWINE WASTE BY AERATOR-AGITATORS ('FUCHS'),
Kiel Univ. (West Germany).
U. Riemann.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 537-544, (1972). 2 fig, 1 tab.

Descriptors: *Farm wastes, *Hogs, *Aerobic treatment, *Waste water treatment, *Waste disposal, Odor, Salmonella, Liquid wastes, Foaming.
Identifiers: Swine, *Aerator-agitators, Liquid manure reactors.

An experimental plant was constructed consisting of 3 liquid manure reactors (each having a recirculating aerator), a pump sump pit, and an earth reservoir for evaporation and distribution of foam in order to investigate deodorization, biological disinfection, treatment, and disposal of pig manure through use of an aerobic treatment system. The pump sump pit received the liquid manure from the third reactor and the partially clarified liquid was distributed or directed to a storage tank. A nearly complete deodorization of fresh manure could be achieved after a daily refill of 3 m3 fresh manure. Bacteriological investigations using salmonellae indicated that the bacteria were dead six hours after entering reactor 1 at temperatures around 50C. Sedimentation tests indicated that organic and inorganic flucculants have a positive effect on the separation process. Fertilization trials revealed (1) Aerated liquid manure is less corrosive than untreated manure to plants. (2) A total of 50 m3/ha aerated liquid manure yields a 10% higher crop of summer barley than does the untreated. (3) Treated or untreated applications to rape-seed had a negative effect. (4) Fertilization of 150 m3/ha of aerated liquid manure on sugar beets gave a slightly better result than the untreated fertilization. (5) Corn digests high liquid manure quantities. Further investigations are in progress. (See also W74-09663) (Merryman-East Central)
W74-09705

NITROGEN LOSSES THROUGH DENITRIFICATION AND OTHER CHANGES IN CONTINUOUSLY AERATED POULTRY MANURE,
Guelph Univ. (Ontario).
G. G. Dunn, and J. B. Robinson.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 545-554, (1972). 10 fig, 1 tab, 7 ref.

Descriptors: *Nitrogen, *Farm wastes, *Poultry, *Waste storage, *Waste water treatment, Liquid wastes, *Oxidation lagoons, Denitrification, Temperature, Biochemical oxygen demand, Chemical oxygen demand, Organic loading, *Canada.
Identifiers: Loading rate, Total solids, Volatile solids.

The objectives were to: (a) determine the effectiveness of pilot scale oxidation ditches in stabilizing the organic loading placed on them, and (b) determine the conditions of oxidation-reduction potential in the liquid waste under which nitrogen was eliminated. Two trials were conducted. The first lasted 138 days during winter (average ditch temperature 11 deg C) conditions. The second lasted 160 days under summer (average ditch temperature 18 deg C) conditions. Two ditches were used which had dividing partitions separating the rotor in the ditches from the birds. The rotor speed on Ditch II was fixed at 95 rpm. The rotor speed in Ditch I (which was variable) was set for the same ditch velocity. Forty-two cages housing 90-100 white leghorns were suspended over each ditch and the droppings fell directly into the ditch. The winter loading rate was 120 mg/liter/day of biochemical-oxygen demand and 375 mg/liter/day of chemical oxygen demand. The summer rate was 150 mg/liter/day of BOD and 500 mg/liter/day of COD. Experimental results indicated that the oxidation ditches were adequate for storing and treating liquid chicken manure in an odor-free condition for periods up to 160 days under the experimental loading conditions. At this loading rate losses of 70-80% of the added nitrogen could be expected with little effect of temperature in the range 11 deg C-18 deg C. (See also W74-09663) (Merryman-East Central)
W74-09706

SOLIDS BALANCE ON A BEEF CATTLE OXIDATION DITCH,
R. O. Hegg, and R. E. Larson.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 555-562, (1972). 3 fig, 4 tab, 7 ref.

Descriptors: *Farm wastes, *Cattle, *Oxidation lagoons, Chemical oxygen demand, Biochemical oxygen demand, Hydrogen ion concentration, Liquid wastes, *Minnesota, *Waste water treatment, *Solid wastes.
Identifiers: Solids balance, Beef, Total solids, Total volatile solids.

The objective was to determine the solids balance on a summer operations of an oxidation ditch for 36 beef animals which were fed a high concentrate ration. This oxidation ditch also included the removal of some of the settled solids during the experiment. The solids balance was made by comparing the total solids, total volatile solids, and fixed solids of the waste matter going into the ditch with material taken out of the ditch. Input consisted of the fecal matter (4.6 pounds dry matter per day) and the urine (15.6 pounds per day) for each animal. The output consisted of the settled solids (partially digested corn) most of which were periodically removed during the experimental period for recycling. Total solids were reduced 39% and total volatile solids were relatively unchanged. (See also W74-09663) (Merryman-East Central)
W74-09707

LAGOONS FOR MILKING CENTER WASTES,
R. Crowe, and R. L. Phillips.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 563-567, (1972).

Descriptors: *Lagoons, *Dairy industry, *Farm wastes, *Waste storage, *Design criteria, *Waste water treatment, Cattle, Biochemical oxygen demand, *New York.

Rural Environmental Assistance Program cost-sharing by the federal government has spurred many requests for assistance from the Soil Conservation Service in construction of lagoons for milking center wastes. A farmer who requests assistance is usually visited by the Cooperative Extension agent, SCS, and a representative of the health department. Location and practicality of the lagoon are influenced by (a) nearest residence, (b) prevailing wind direction, (c) general soils in the area, (d) type of outlet-gravity or pumping, (e) discharge point, (f) stream location, characteristics, and classification, (g) herd size - present and future, (h) present waste disposal system and (i) estimated cost of the lagoon. Lagoon layouts are designed with a surfac0 area of 125 square feet per cow, are usually partially below and partially above the ground, and have a length to width ratio of 3:1. Rectangular shape is most economical. Maximum depth should be 5 feet and minimum 2 feet. The botton should be level. Once the details are worked out, a cost estimate is made and the drawings and estimate are reviewed with the landowner for his concurrence and approval. The drawings and specifications, with a summary design report and application, are then submitted to the county health department for approval. (See also W74-09663) (Merryman-East Central)
W74-09708

PILOT PLANT COMPARISON OF LIQUID AND DRY WASTE MANAGEMENT SYSTEMS FOR POULTRY MANURE,
Cornell Univ., Ithaca, N.Y.
D. C. Ludington, A. T. Sobel, R. C. Loehr, and A. G. Hashimoto.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 569-580, (1972). 2 fig, 4 tab, 6 ref.

Descriptors: *Farm wastes, *Liquid wastes, *Poultry, *Odor, *Oxidation lagoons, *Waste water treatment, Air pollution, Aeration, Solid wastes, Pilot plants.
Identifiers: *Waste management systems, Undercage drying-forced air, Undercage drying-fins, Diffused aeration.

Two primary waste management techniques are known to control the production of odors. The first is removal of moisture from manure soon after defecation. The second is to properly aerate a liquefied manure and maintain the waste in an aerobic condition. Four different systems based on these two techniques were studied: (a) oxidation ditch, (b) undercage drying-forced air, (c) undercage drying-fins, and (d) diffused aeration. These experiments proved that properly aerating a liquefied manure and removing sufficient moisture from fresh manure will control odors in a poultry house. If a high degree of odor control is necessary, then the properly aerated liquid manure system would be the one to select. If the conditions are less severe, undercage drying may accomplish sufficient odor control at a reduced operating cost. The losses of nitrogen for the various systems may or may not be an advantage depending upon the local situation and the point of ultimate disposal. The removal of volatile solids does permit operation at a lower total solids concentration with less dilution water. Specific trials and results are outlined and tabulated. (See also W74-09663) (Merryman-East Central)
W74-09709

CHEMICAL ADDITION TO TRICKLING FILTER PLANTS,
Beard (Arthur) Engineering, Inc., Chevy Chase, Md.
G. L. Nickerson, C. M. Robson, R. D. Morrison, and R. C. Clinger.
Journal Water Pollution Control Federation, Vol 46, No 1, p 133-147, January 1974. 9 fig, 7 tab, 3 ref.

Descriptors: *Filtration, *Virginia, Water treatment, *Biochemical oxygen demand, *Suspended solids, Hydraulic engineering, Chemical engineering, *Waste water treatment, *Trickling filters.
Identifiers: *Fairfax County(Va).

A chemical addition system for increasing the overall BOD and SS removals at two Fairfax County, Virginia, trickling filter wastewater treatment plants is described. Ferric chloride was added at the influent end of the grit chamber and cationic polymer was added in the Parshall flume, just before the flow enters the primary clarifiers. These additions achieved approximately 85 percent SS and 60 percent BOD removals. Hydraulic capacity was increased by raising the wall levels of critical manholes and structures where overflows had previously occurred, but this correction frequently caused an overflow at another. A total chemical cost to treat the liquid flow averaged approximately $85 per million gallons at one plant and $71 per million gallons at the other plant. Increased sludge handling problems may be expected when chemical addition to the liquid stream is practiced for increased removal of oxygen demanding materials. Existing sludge handling facilities should be carefully reviewed for adequacy. Any necessary improvement should be made before liquid stream chemical addition. Further, addition of chemicals to the sludge handling system may be required to enhance thickening and dewatering operations. (Merritt-FIRL)
W74-09710

SMALL TOWN SPENDS A BIG $8 MILLION,
Whitman and Howard, Inc., Boston, Mass.
R. E. Hickeman.
Water and Wastes Engineering, Vol 10, No 12, p 42-44, December, 1973.

Descriptors: *Water treatment, *Rhode Island, *Activated sludge, *Aeration, Septic tanks, Waste treatment, *Waste water treatment, *Tertiary treatment.
Identifiers: West Warwick(R.I.), Pawtuxet River(R.I.).

The design and operation of the secondary waste treatment plant in West Warwick, Rhode Island are described. Renovation and enlargements were made on existing plants to provide a 5.0 mgd facility to help clean up the Pawtuxet River. The $2.5 million treatment plant can provide conventional complete mix activated sludge and step aeration methods of secondary treatment depending on the quality, quantity, and characteristics of the raw wastewater. Septic from individual homeowner cesspools and septic tanks is delivered by tank trucks in a daily volume ranging from 6,000 to 25,000 gallons. The septage is passed to a receiving tank, chlorinated for odor control, degritted, and stored. Four square aeration tanks each with one 7.5 hp fiberglass mechanical surface aerator registers BOD levels ranging from 1000 milligrams/liter to 350 milligrams/liter. The system readily adjusts to varying demands while maintaining a mixed liquor concentration between 2.900 and 4.700 milligrams/liter and dissolved oxygen levels between 2.0 and 3.0 milligrams/liter. The digester was converted into a post-chlorine contact tank which pumps the excess activated sludge into two sludge flotation thickeners. The thickened sludge is then dewatered. (Merritt-FIRL)
W74-09711

ALTERNATIVE STRATEGIES FOR MANAGING WASTEWATER,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
R. S. Howe.
Journal of Soil and Water Conservation, Vol 28, No 6, p 252-255, November/December, 1973. 2 tab, 10 ref.

Descriptors: *Water management(Applied), Water treatment, *Activated sludge, *Land management, Land use, *Waste water treatment, Waste disposal.
Identifiers: *Physical-chemical treatment, *Land disposal.

Strategies for managing wastewater are discussed; they include the activated sludge process, physical-chemical treatment, and land disposal. The activated sludge process consists of pretreatment, primary clarification, and single stage biological treatment. The process requires some means for disposing of sludge, as through dewatering at the plant and then transporting the dried solids to a land disposal site, or it may entail transport of liquid sludge by barge, truck, or pipe to a land disposal site. The physical-chemical process requires a means for disposal of the substantial quantities of solids that are generated. Chemicals frequently used are lime, alum, and iron salts. Land disposal systems can be categorized as infiltration systems (recharge basins, septic tanks, absorption fields, spray disposal, and ridge and furrow basins) or irrigation systems (spray irrigation, flood irrigations, and the living filter). Advantages of the activated sludge system include small land area, lower initial capital investment, removal of certain toxic materials, ability to handle overload situations, and greater immunity to the vagaries of weather. Disadvantages include higher operating costs, more difficult operation, and use of chemicals that may introduce trace quantities of impurities that result in water quality standard violations. (Merritt-FIRL)
W74-09712

A MEMBRANE BIOLOGICAL FILTER DEVICE FOR REDUCING WATERBORNE BIODEGRADABLE POLLUTANTS,
Boyce Thompson Inst. for Plant Research, Inc., Yonkers, N. Y.
G. W. McClure.
Water Research, Vol 7, No 11, p 1683-1690, 1973. 2 fig, 2 tab, 12 ref.

Descriptors: Filtration, Membranes, *Biological membranes, *Membrane processes, *Filters, *Herbicides, *Biodegradation, *Waste water treatment.
Identifiers: Isopropylphenylcarbamate.

A membrane biological filter device for reducing waterborne biodegradable pollutants was modeled by a laboratory system. A phenylcarbamate-degrading population of microorganisms reduces the concentration of the herbicide isopropylphenylcarbamate (IPC) in a continuously flowing stream. The microorganisms are kept separate from the feed stream by an ultrafilter membrane which retains the microorganisms, but allows passage of all smaller materials. As the feed stream passes through the device, IPC is transferred to the bath of microorganisms and metabolized. The percentage reduction of IPC in the feed stream depends primarily on the efficiency of transfer across the membrane, the velocity of the feed stream, the quantity of microbes retained in the bath, and the factors affecting their activity. An equation is derived relating these variables under the assumption of complete transfer of IPC to the bath and a constant rate of IPC degradation per unit of microbes. Problems and improvements are discussed. (Merritt-FIRL)
W74-09713

OZONE: AN ALTERNATIVE TO CHLORINE,
J. T. Sliter.
Journal Water Pollution Control Federation, Vol 46, No 1, p 4-6, January, 1974.

Descriptors: Municipal water, *Ozone, *Coliforms, Sewage bacteria, *Disinfection, Viruses, Biochemical oxygen demand, Chemical oxygen demand, Phenols, *Waste water treatment, Costs.
Identifiers: Cyanides.

The advantages of ozone as an alternative to chlorine disinfection of wastewaters are discussed. Beginning in 1977, all municipal treatment plants must disinfect their effluent to achieve a fecal coliform level of 200/100 milliliters. Pilot investigations show that ozone is a quicker and more efficient disinfectant than chlorine by a factor of 3,000. A five milligram/liter dose of ozone applied for less than two minutes yielded a significant reduction in total plate count and fecal coliform levels in wastewater effluent. Ozone can reduce the number of viruses, but the techniques are tentative, and actual reductions uncertain. Ozone does not leave a residual of compounds toxic to aquatic life. Ozone can reduce the concentration of suspended solids to less than two milligrams/liter. Tertiary treatment plants have used ozone to reduce the biochemical oxygen demand, the chemical oxygen demand, cyanides, and phenols. About two parts ozone destroy one part phenol. Production cost is the largest single item in ozone treatment. It would cost a one mgd plant using ozone for tertiary treatment $0.26/1000 gal; but a 50 mgd plant, only $0.10/1000 gal. (Merritt-FIRL)
W74-09714

CARBON TREATMENT OF A MUNICIPAL WASTEWATER,
Envirotech Corp., Salt Lake City, Utah. Eimco Process Machinery Div.
D. E. Burns, and G. L. Shell.
Journal Water Pollution Control Federation, Vol 46, No 1, p 148-164, January, 1974. 8 fig, 13 tab, 21 ref.

Descriptors: *Utah, *Pilot plants, Carbon, *Waste water treatment, Municipal wastes, *Sewage treatment.
Identifiers: *Salt Lake City(Utah), Powdered carbon, *Carbon treatment.

The use of powdered carbon for the removal of soluble organics from municipal raw wastewater was evaluated in a Salt Lake City, Utah, pilot plant study. The carbon treatment system included two carbon contactors, a granular media filter, a gravity thickener, and a vacuum filter. Solid contact units were very effective for contacting and removing powdered carbon for chemically treated and gravity clarified municipal wastewater. The two-stage, counter-current contacting was more efficient, (requiring less carbon) than single-stage contacting. The total solids recycle and variable area clarification zone features of the units used were key factors in providing a significant level of biological activity without odor problems and in accomplishing effective removal of carbon solids. Effective gravity clarification of carbon suspensions was achieved at overflow rates of up to 0.8 gpm/sq ft without the use of flocculation aids. Granular media filtration effectively removed carbon particles from carbon contactor effluent. Alum treatment followed by a two-stage counter-current carbon contacting with 75 milligram/liter dosage would cost $0.83/1000 gal, including chlorination. The predicted plant effluent quality would be considerably better than a secondary biological treatment effluent for all parameters, but particularly for phosphorus and suspended solids. (Merritt-FIRL)
W74-09715

DATA ACQUISITION AND COMBINED SEWER CONTROLS IN CLEVELAND,
Cleveland Dept. of Public Utilities, Ohio.
K. A. Pew, R. L. Callery, A. Brandstetter, and J. J. Anderson.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2276-2289, November, 1973. 10 fig, 9 ref.

Descriptors: *Combined sewers, *Rainfall-runoff relationships, Storm runoff, *Waste water treatment, Model studies, *Ohio, Water storage.
Identifiers: *Cleveland(Ohio).

The development of a system for the comprehensive control of combined sewer overflow pollution in the Southerly Sewerage District of Cleveland, Ohio, is described. The project will acquisition and analyze real time rainfall and sewer system load information, and will operate by closed loop automatic control. The control system will operate an optimum combination of control, storage, treatment, and conveyance facilities. Automatic wastewater samplers have been purchased, and automated chemical analyzers are being acquired to analyze chemical oxygen demand, total Kjeldahl nitrogen, sulfate, phosphate, nitrate, ammonia, and chloride. Mathematical models were developed and used as analytical tools for the design and control of the sewer system improvements, and remotely operated regulators were designed. The construction cost has not yet been estimated, but should be in the order of $60 million or approximately $300/acre ($7400 ha), less than the cost of sewer separation. (Merritt-FIRL)
W74-09716

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
R. P. Monti, and P. T. Silbermann.
Water and Wastes Engineering, Vol 11, No 4, p 36-40, April, 1974. 5 fig, 1 tab.

Descriptors: *Waste water treatment, *Alternate planning, Ammonia, Suspended solids, BOD, Waste disposal, *Filtration, Filters, Nitrification, Nitrates, *Waste disposal, *Denitrification, Effluents, Infiltration, Irrigation, Runoff.
Identifiers: *Polishing ponds, Microstraining device, *Treatment alternatives, Sand filtration.

Alternatives to conventional secondary waste treatment that will meet the best possible practical treatment requirements of 1983 are discussed. Because the Federal requirements are not entirely clear on BOD, ammonia, and suspended solids, an additional treatment step is proposed. If land is available, the least costly treatment may be a polishing pond. If no land is available, rapid sand filtration columns could be used. A microstraining device could remove additional suspended solids and their associated BOD from treatment plant effluents. The most economical method of ammonia removal is single stage nitrification. This biological process converts ammonia to nitrates in an aeration tank. The most troublesome of the pollutants is nitrate which has a maximum allowable groundwater limit of 10 mg/liter. If ground disposal is chosen, the most reasonable type of denitrification process would be a packed column reactor added after conventional treatment and using methanol addition as a source of carbon for the denitrifying organisms. In the case of land disposal, there are three basic techniques for surface application of waste water effluent to the land: spray irrigation, overland runoff, and rapid infiltration. (Merritt-FIRL)
W74-09718

STOCHASTIC ANALYSIS OF ORTHOKINETIC FLOCCULATION,
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
P. W. Cockerham, and D. M. Himmelblau.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE2, p 279-293, April, 1974. 8 fig, 1 tab, 7 ref.

Descriptors: *Stochastic processes, *Flocculation, *Water treatment, Model studies, Dispersion, *Waste water treatment, Statistical methods.

The application of a stochastic analysis to orthokinetic flocculation, a common operation in water treatment, is illustrated. Both the unsteady-state and the steady-sample response could be represented by a normal distribution regardless of the types of distributions used for the flocculation model inputs and parameters. The sample mean response agreed with the deterministic solution if normal distributions are used for the flocculation model inputs and parameters, but not otherwise. Dispersion in the model parameter had a greater effect on the dispersion of the sample output than did the model parameters. Dispersion in G (the root mean squared velocity gradient) had the least effect on the dispersion of the sample output. The degree of dispersion in the process flow rate had little effect on the flocculator overdesign factor. The stochastic approach is applicable to the stochastic analysis of other important processes in water and waste water treatment. Of particular value is the method of calculating overdesign factors. The stochastic approach does not reduce the uncertainty involved in the processes, but it does not allow one to make more objective decisions about the uncertainty. This is becoming more and more important as effluent quality standards become more stringent. (Merritt-FIRL)
W74-09719

APPARATUS FOR TREATING WASTE FLUIDS BY MEANS OF DISSOLVED GASES,
Pollution Control Engineering, Inc., Downey, Calif. (assignee).
G. E. Hurst.
U.S. Patent 3,773,179. Official Gazette of the United States Patent Office, Vol 916, No 3, p 932, November 20, 1973.

Descriptors: *Suspended load, Suspended solids, *Waste disposal, *Patents, Equipment, *Waste water treatment.
Identifiers: Apparatus.

An apparatus for treating wastewater to remove suspended pollutants is described. It consists of a tank with a plurality of compartments through which the fluid is repeatedly pumped from one compartment to the next. At each pumping station, gas is injected at the suction side of the pump and back pressure is maintained in the discharge line to force more gas into solution. Effluent from each compartment is taken near the bottom and the discharge is located midway of the height, confined to a small area, and then deflected by a deflector plate. Clarified water is removed by a riser tube from the bottom of the final compartment and flows over a weir. The floated matter is removed from the fluid surfaces in each compartment by skimming or other methods. (Merritt-FIRL)
W74-09721

METHOD FOR TREATING WATER CONTAINING SUSPENDED SOLIDS FROM A SANITARY SYSTEM,
Ecodnye Corp., Chicago, Ill. (assignee).
J. W. McKibben, B. L. Goodman, and R. B. Higgins.
U.S. Patent 3,770,624. Official Gazette of the United States Patent Office, Vol 916, No 1, November 6, 1973.

Descriptors: Suspended solids, Treatment, *Separated sewers, *Recycling, *Aeration, *Patents.
Identifiers: Apparatus.

An improved method and apparatus for treating water containing suspended solids from a sanitary system are described. The water is aerated and delivered to a screen with a directional component across the screen surface and a directional component through the screen. The screen has openings large enough to pass the majority of the solids suspended in the water, and has the ability to hold a coating of these solids on its upstream side. The flow of water is controlled so that a coating of the suspended solids from the water is formed on the screen surface. The delivery of water containing these suspended solids to the screen is continued with a directional component across the screen and a directional component through the screen, in order to filter solids from the water passing through the coating and screen. The relationship between the directional components across and through the screen is controlled to maintain the coating on the screen. The water that is passed through the screen is stored, and is recycled to the sanitary system. (Merritt-FIRL)
W74-09724

APPARATUS FOR RELEASING CHEMICALS CLEARING AND CLEANING WASTE PIPES,
R. M. Stalnaker.
U. S. Patent 3,771,968. Official Gazette of the United States Patent Office, Vol 916, No 2, p 617-618, November 13, 1973.

Descriptors: *Pipes, Engineering structures, *Sewers, *Cleaning, Treatment, *Patents.
Identifiers: Apparatus.

An apparatus for releasing chemicals that clears and cleans waste pipes is described. An elongated tubular-shaped dispenser with a plurality of axially and circumferentially spaced openings is attached to a rotational support plug. The dispenser releases chemicals in predetermined amounts in response to flushing water. It is capable of destroying, clearing, and cleaning obstructions located in the waste pipe. A chemical capable of aiding in the control of pollution could also be utilized in the dispenser. The disposable dispenser is replaced after the chemicals are released. (Merritt-FIRL)
W74-09725

WASTEWATER TREATMENT USING ELECTROLYSIS WITH ACTIVATED CARBON CATHODE,
General Electric Co., Schenectady, N.Y. (assignee).
M. Kawahata, and K. R. Price.
U.S. Patent 3,788,967. Official Gazette of the United States Patent Office, Vol 918, No 5, p 1968, January 29, 1974.

Descriptors: Waste water, *Electrolytes, *Activated carbon, *Waste water treatment, *Oxidation, Municipal wastes, *Patents.

An improvement in the electrolytic treatment of wastewater is described in which the reduction of oxygen on an activated carbon cathode is employed to form hydrogen peroxide. The peroxide oxidizes the organic carbon pollutants in the wastewater. The oxygen is fed to the activated carbon cathode from outside the electrolytic cell. The cathode is part of the enclosure for feeding the gas to the surface, which forms part of the boundary of the cell compartment. (Merritt-FIRL)
W74-09729

VACUUM SEWAGE CONVEYING WITH VACUUM OPERATED VALVE,
B. C. Burns.
Patent 3,788,338. Official Gazette of the United States Patent Office, Vol 918, No 5, p 1812-1813, January 29, 1974.

Descriptors: Pipes, Engineering structures, *Sewage, *Pipelines, *Sewage disposal, *Patents, Waste water treatment.
Identifiers: *Vacuum sewage conveyance.

A method and apparatus for conveying sewage by vacuum-induced plug flow are described. The sewage is drawn from a sewage-collecting region into a vacuum line pipe through a valve, and moves toward the source of vacuum by vacuum-induced plug flow caused by the interposition of volumes of air between plugs of sewage. A control zone in an operator portion of the vacuum valve is controllable by a low-pressure reservoir for opening the valve. The reservoir is maintained at a low pressure through a vacuum tap conduit communicable with the reservoir and the vacuum line conduit. The sewage-collecting region may be an underground collecting tank which contains equipment for controlling operation of the vacuum valve which may be located outside the collecting region in a separate housing just below grade. Electrical power used at the collecting region may be supplied solely from a central panel through cable laid in a trench along the vacuum line conduit. A rigid pipe assembly in the collecting tank is connected several feet above the tank bottom, but below grade, to a pipe assembly of the vacuum valve, and the orientation may be such as to permit disconnection of pipes at the vacuum valve without causing leakage in the region where workmen must stand. (Merritt-FIRL)
W74-09731

PRIMING UNIT FOR DISTRIBUTING PRIMING WATER TO MULTIPLE SEWER LINE WATER TRAPS,
Precision Plumbing Products, Inc., Portland, Oreg. (Assignee).
J. B. Watts.
U.S. Patent 3,776,269. Official Gazette of the United States Patent Office, Vol 917, No 1, p 144, December 4, 1973.

Descriptors: Conduits, Water transfer, *Sewers, *Conveyance structures, Equipment, *Patents, Waste water treatment.
Identifiers: *Priming water.

A priming unit for distributing priming water to multiple sewer line water traps is described. It consists of a case of compact dimensions and means for coupling the case to a source of priming water. A plurality of water outlet pipes penetrate the case floor by a predetermined distance to permit use of the water contained in the case to measure the level condition of the unit. There is substantially equal distribution of priming water through all the pipes to the various sewer line water traps. (Merritt-FIRL)
W74-09732

SOME LESSONS FROM MODEL AND FULL-SCALE TESTS IN RECTANGULAR SEDIMENTATION TANKS,
Imperial Chemical Industries Ltd., Runcorn (England). Mond Div.
G. A. Price, and M. S. Clements.
Water Pollution Control, Vol 78, No 1, p 102-113, 1974. 8 fig, 11 tab, 7 ref.

Descriptors: *Waste water treatment, *Model studies, *On-site tests, *Settling basins, Sedimentation, Treatment facilities, Efficiencies, Intakes.
Identifiers: Inlet design, Flow-through time, Settling time.

Results of research into the effects of inlet changes, density and wind-induced currents on the performance of rectangular sedimentation tanks are summarized. The investigation included experiments on both models and full-scale tanks at six sewage works to test the importance of time ratio and inlet design on the efficiency of tanks. Time ratio is 00046measure of the streaming throug the tank and defined as the ratio of effective flow-through time to effective settling time with an ideal value of unity. (Sandoski-FIRL)
W74-09736

COAGULATION OF STORMWATERS AND LOW ALKALINITY WASTEWATERS,
Notre Dame Univ., Ind.
L. H. Ketchum, Jr., and W. J. Weber, Jr.
Journal Water Pollution Control Federation, Vol 46, No 1, p 53-62, January, 1974. 17 fig.

Descriptors: Chemical engineering, Water treatment, *Storm water, Hydrogen ion concentration, *Alkalinity, *Waste water treatment, *Lime, *Silica, *Coagulation.
Identifiers: Activated silica, Clarification.

The clarification of low alkalinity wastewaters by the chemical combination of lime and activated silica was investigated. To facilitate control and to study significant variables, synthetic systems were made by adding known quantities of selected substances to water to produce the desired experimental characteristics. Studies of stormwaters and wastewaters were subsequently conducted to confirm the observation made on the synthetic systems. The lime and activated silica were effective. Low alkalinity wastewater can be coagulated with .002 moles/liter of lime or .00075 moles/liter of lime plus 3.75 milligrams/liter of activated silica. Based on these dosages, the cost per million gallons of wastewater treated using lime alone and lime plus activated silica are $11.92 and $8.72, respectively. This chemical cost savings and the decreased sludge to be handled make the use of activated silica economically advantageous for low alkalinity wastewaters. (Merritt-FIRL)
W74-09738

DEVELOPMENTS IN THE TREATMENT OF SEWAGE FROM SMALL COMMUNITIES.
Department of the Environment, (U.K.), Notes on Water Pollution, No 60, p 1-4, March, 1973. 14 ref.

Descriptors: *Sewage treatment, *Treatment plants, *Rural areas, Maintenance, Septic tanks, Percolation, Activated sludge, Aeration, Stabilization, Oxidation lagoons, Biological treatment, Filtration, Effluents, Suspended solids, Filters, Digestion tanks, Sludge disposal, *Waste water treatment.
Identifiers: *United Kingdom.

The treatment of sewage from small communities is discussed and recent developments are described. Many problems of small treatment plants relate directly to the fact that small plants can normally provide little supervision or maintenance and privately owned plants are especially liable to serious neglect. Before 1960, there was essentially only a combination of septic tanks and percolating filters for treating sewage from small communities. During the last decade a variety of modified activated sludge systems has been actively developed particularly for small scale use. Three forms of plant have evolved: extended aeration, contact stabilization, and the oxidation ditch. Purification plants using rotary disc biological contactors have recently been introduced into the United Kingdom. Extended filtration and submerged bed aeration plants have been commercially developed to a small scale as small package plants. The main developments in effluent polishing for small systems have been with the simplest systems: grass plots, upward flow clarifiers; and slow sand filters. The use of separate aerobic digestion plants to stabilize raw or septic tank sludge at central collection works has overcome the problem of sludge disposal. (Merritt-FIRL)
W74-09743

CHEMISTRY OF MODERN WATER CHLORINATION, I, INTRODUCTION, II, THE CHEMISTRY OF CHLORINATION,
Newcastle and Gateshead Water Co., Newcastle-upon-Tyne (England).
A. T. Palin.
Water Services, Vol 78, No 935, p 9-12, January, 1974. 3 fig, 2 tab, 8 ref.

Descriptors: *Chlorination, *Chlorine, *Reviews, *Disinfection, *Water treatment, Waste water treatment.

A review of the present state of chlorine use for the disinfection of water is presented with emphasis on the chemistry of chlorination. The forms of chlorine, which include gas, solutions, solids, and new products, chlorine dissolved in water, breakpoint reactions, and definitions of modern chlorination are discussed. (See also W74-09745) (Sandoski-FIRL)
W74-09744

CHEMISTRY OF MODERN WATER CHLORINATION, III, DISINFECTION BY CHLORINE, IV, CHLORINATION OF WASTE-WATER AND INDUSTRIAL WATERS,
Newcastle and Gateshead Water Co., Newcastle-upon-Tyne (England).
A. T. Palin.
Water Services, Vol 78, No 936, p 53-56, February, 1974.

Descriptors: *Reviews, *Disinfection, *Chlorine, *Water treatment, Hydrogen ion concentration, Temperature, *Waste water treatment, Industrial water, *Chlorination.
Identifiers: Residual chlorine, Contact time.

Disinfection by chlorine is discussed with regard to the effect of the hydrogen ion concentration, the effect of temperature and time of contact, and the nature of residual chlorine and minimum safe levels. Also discussed are the chemistry of waste water chlorination, residual chlorine control, and chlorine requirements. (See also W74-09744) (Sandoski-FIRL)
W74-09745

PROTEIN RECOVERY FROM PROCESS EFFLUENTS USING ION-EXCHANGE RESINS,
Tasman Vaccine Lab. Ltd., Poole (England). Ecotech Systems Div.
R. A. Grant.
Process Biochemistry, Vol 9, No 2, p 11-14, February/March, 1974. 2 fig, 12 tab.

Descriptors: *Ion-exchange, *Resins, *Proteins, *Effluents, Food processing industry, Hydraulic properties, Biochemical oxygen demand, Adsorption, Water treatment, Industrial wastes, Byproducts, Waste water treatment.
Identifiers: *Recovered protein.

A process was developed which permits the separate recovery of protein and fat from meat, poultry and other food processing effluents, while at the same time achieves a large reduction in the BOD level. The process uses a recently developed ion-exchange resin capable of adsorbing proteins and other macromolecules. The resins can be manufactured in the granular form giving excellent hydraulic properties. They can be used in a conventional type plant with the usual facilities for cleaning the bed by backwashing. Both anion and cation exchange forms of the resin are available and combination of these makes it possible to treat water up to a very high standard, that is, BOD values of less than 10 mg/liter have been achieved. (Merritt-FIRL)
W74-09747

TUNNELS MAY STORE STORMWATER FOR LATER TREATMENT.
The American City, Vol 88, No 12, p 75, December, 1973.

Descriptors: *Wisconsin, *Tunnels, *Storm water runoff, Subsurface drainage, *Storm drains, *Underground storage, Combined sewers, Sanitary sewers.
Identifiers: *Milwaukee(Wisc).

A study of a proposal to build 20 miles of tunnels in bedrock under Milwaukee to store overflow from a combined sanitary and storm sewer system was approved by a Southwestern Wisconsin Regional Planning Commission committee. The tunnels would measure about 30 by 40 feet each, would be 250 feet below the surface, and would connect 112 outfalls of three rivers. If the three-year, $2.3 million study is approved by the necessary agencies the Federal government would pay 75 percent of the $175 million cost, the state 12.5 percent, and the sewerage commission 12.5 percent. (Merrit-FIRL)
W74-09749

MERCURY REMOVAL BY CONVENTIONAL WATER-TREATMENT TECHNIQUES,
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 5F.
W74-09773

SOLVENT EXTRACTION IN PROCESSES FOR METAL RECOVERY FROM SCRAP AND WASTE,
Warren Spring Lab., Stevenage (England).
A. W. Fletcher.
Chemistry and Industry, p 414-419, May 5, 1973. 15 fig, 2 tab, 14 ref.

Descriptors: *Industrial wastes, *Recycling, *Solvent extractions, *Metals, Metallurgy, Nickel, Cobalt, Effluents, Sludge treatment, Leaching, Separation techniques, *Waste water treatment.

A significant and growing proportion of metals consumed by industry is being provided by the recycling of scrap and/or waste. These include process wastes, capital wastes, domestic refuse, and effluents. Traditionally, the processes used to recover metal from wastes were pyrometallurgical, but currently there has been growing interest in hydrometallurgical processes, involving dissolution, separation and reduction to metal. In this sequence of operations, solvent extraction is proving to be a versatile method for metal recovery. The equipment requirements are modest, the process is simple to operate on a continuous basis, and its value and versatility has been proved by successful commercial application. Several metal recovery techniques involving solvent extraction are described in detail for the case of refractory Ni-Co alloy scrap which is not amenable to processing by conventional techniques. Flowsheets are presented for the recovery of copper, zinc, and cadmium from base metal and for the recovery of cobalt, nickel, iron, copper, chromium, zinc, and manganese from chemical process wastes. Profitable application of the solvent extraction method to treatment of effluents depends on flow and metal content of the waste. (Jernigan-Vanderbilt)
W74-09784

5E. Ultimate Disposal Of Wastes

GROUND WATER QUALITY AND SOLID WASTE MANAGEMENT-- A SELECTIVE BIBLIOGRAPHY,
California State Dept. of Water Resources, Sacramento.
D. M. Hill, and R. Zipp.
Central District Report, March 1974. 59 p, 389 ref.

Descriptors: *Bibliographies, *California, *Water pollution, *Landfills, *Garbage dumps, Waste disposal.
Identifiers: Solid waste management.

As a step in evaluating the potential for groundwater degradation beneath solid waste disposal sites in California under varying climatic, geologic, and other conditions, a list of reports on solid

wastes and groundwater quality was compiled. The list is stored on tape so that new entries can be inserted and old entries corrected easily in anticipation of periodic updating of the list. (Knapp-USGS)
W74-09319

UNDERGROUND INJECTION OF WASTEWATERS IN THE OHIO VALLEY REGION.
Ohio River Valley Sanitation Commission, Cincinnati. Committee on Subsurface Industrial Wastewater Injection,
For primary bibliographic entry see Field 5G.
W74-09324

WASTE MANAGEMENT: GENERATION AND DISPOSAL OF SOLID, LIQUID AND GASEOUS WASTES IN THE NEW YORK REGION,
Regional Plan Association, N.Y.
For primary bibliographic entry see Field 5G.
W74-09353

GEOLOGIC ASPECTS OF LANDFILL REFUSE DISPOSAL,
Louisville Univ., Kentucky. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-09375

DISPOSAL OF AIRCRAFT WASHRACK WASTE WATER,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
For primary bibliographic entry see Field 5D.
W74-09376

THE USE OF OCEAN OUTFALLS FOR MARINE WASTE DISPOSAL IN SOUTHEAST FLORIDA'S COASTAL WATERS,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5D.
W74-09403

PROCEEDINGS-WORKSHOP ON LAND DISPOSAL OF WASTEWATERS.
North Carolina State Univ., Raleigh. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W74-09422

MANAGEMENT OF LANDS USED FOR WASTE DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W74-09424

WASTEWATER AND SOIL INTERACTION,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W74-09425

IRRIGATION COST FOR LAND DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-09428

COSTS AND RETURNS OF LAND SPREADING WASTWATER,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W74-09429

DEWATERING DIGESTED PRIMARY SLUDGE,
Los Angeles County Sanitation District, Calif.
For primary bibliographic entry see Field 5D.
W74-09441

AVAILABLE AIR MEASUREMENTS APPLIED TO FLOTATION THICKENER EVALUATIONS,
CH2M/Hill, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W74-09451

STUDY OF THE DIFFUSION OF THE DEEP SEA DISPOSAL OF RESIDUAL WATER,
For primary bibliographic entry see Field 5B.
W74-09472

ENVIRONMENTAL HAZARDS OF NUCLEAR WASTES,
For primary bibliographic entry see Field 5B.
W74-09502

AGRICULTURAL WASTE MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-09504

STATE-OF-THE-ART OF WASTE DISPOSAL IN THE COATINGS INDUSTRY (AS OF JUNE 1973),
R. Tackett.
Journal of Paint Technology, Vol 46, No 590, p 63-68, March, 1974. 8 tab.

Descriptors: *Survey, *Waste disposal, *Coatings, *Reclamation, *Industrial wastes, Pollution abatement, Equipment, Dusts, Liquid wastes, Solid wastes, Gases, Recycling, Landfills, Sludge disposal, Alternate planning.

The results of a survey on waste disposal techniques currently in use in the coatings industry are discussed. The questionnaire which was answered by 558 companies, was divided into four parts: vapors, liquids, dusts, and solids. Questions concerning installation of control equipment and its operation were asked in each section. Equipment was installed by 114 companies for controlling water based liquid wastes. The most popular methods of control were settling tanks, ponds, or basins. The main problem of control methods for all wastes is that they generate a solid waste or sludge which presents a serious disposal problem. The coating industry will have to develop an alternate method to landfill for disposal of solid waste or sludge. Reclamation may be most suitable because of the value of some of the components. (Merritt - FIRL)
W74-09506

SUBSURFACE DISPOSAL OF WASTE IN CANADA, INJECTION OF LIQUID WASTES IN DEEP WELLS, A PRELIMINARY APPRAISAL,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 5B.
W74-09536

SUBSURFACE DISPOSAL OF PICKLE LIQUOR,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
A. F. Bayazeed, and E. C. Donaldson.
Available from NTIS, Springfield, Va. 22151 as PB-225 273, Price $3.00 printed copy; $1.45 microfiche. Bureau of Mines Report of Investigations RI-7804, 1973. 31 p, 23 fig, 6 tab, 13 ref.

Descriptors: *Waste disposal wells, *Injection wells, *Acids, *Chemical wastes, Water pollution effects, Industrial wastes, Path of pollutants, Sandstone, *Illinois, *Indiana.
Identifiers: Pickle liquors(Wastes), *Mt. Simon Sandstone(Ill.-Ind.).

Underground injection of waste pickle-liquor from steel processing was surveyed. Hydrochloric and sulfuric acids are being injected into deep wells completed in the Cambrian age Mt. Simon Sandstone Formation in Illinois and Indiana. The average depth of injection wells is 4,000 feet, and injection is mostly by gravity flow at rates as high as 4,000 barrels per day. The details of the design and operating history of a well located near Gary, Ind., are discussed. Laboratory tests show that the Mt. Simon Sandstone is sensitive to freshwater. The adsorption of iron and neutralization of acids by sandstone was estimated using cores from deep wells and an outcrop. (Knapp-USGS)
W74-09583

WASTE MANAGEMENT RESEARCH.
For primary bibliographic entry see Field 5D.
W74-09663

PYROLYSIS AS A METHOD OF DISPOSAL OF CATTLE FEEDLOT WASTES,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W74-09673

DAIRY MANURE WASTE HANDLING SYSTEMS,
For primary bibliographic entry see Field 5D.
W74-09674

AUTOMATED HYDRAULIC WASTE-HANDLING SYSTEM FOR A 700-HEAD SWINE FACILITY USING RECIRCULATED WATER,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W74-09682

OPERATIONAL PROBLEMS OF PORK PRODUCTION RELATED TO ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 5D.
W74-09683

OPERATIONAL PROBLEMS OF POULTRY PRODUCTION RELATED TO ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 5D.
W74-09689

EVALUATION OF SWINE WASTE TREATMENT ALTERNATIVES,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5D.
W74-09691

EVALUATION OF BEEF WASTE MANAGEMENT ALTERNATIVES,
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 5D.
W74-09693

CHARACTERISTICS OF WASTES FROM SOUTHWEST BEEF CATTLE FEEDLOTS,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 5D.
W74-09694

TREATMENT AND DISPOSAL OF SWINE WASTE,
For primary bibliographic entry see Field 5D.
W74-09704

5F. Water Treatment and Quality Alteration

CLEAN WATER--A CHALLENGE TO THE NATION, HIGHLIGHTS AND RECOMMENDATIONS OF THE NATIONAL CONFERENCE ON WATER POLLUTION.
Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-09260

HEALTH ASPECTS OF LAND APPLICATION OF WASTEWATER AT MILITARY INSTALLATIONS,
Army Medical Research and Development Command, Washington, D.C. Sanitary Engineering Research Branch.
For primary bibliographic entry see Field 5D.
W74-09426

'PIG' BRINGS BACK CAPACITY,
Denver Water Dept., Colo.
For primary bibliographic entry see Field 8C.
W74-09516

RURAL WATER SYSTEM DESIGNED FOR SUBURBAN USE,
Public Works, Vol 104, No 11, p 77, November, 1973.

Descriptors: *Water supply development, Water management(Applied), Rivers, *Ohio, Economics, *Financing, Loans, *Rural areas, Suburban areas, *Water treatment.
Identifiers: Olentangy River(Ohio), Columbus(Ohio).

The organization of the non-profit Del-Co Water Company to build and operate a rural water system designed for suburban use near Columbus, Ohio is described. The company was financed by a membership fee and a loan of $225,000 from the Farmers Home Administration. There are more than 1,500 members in Del-Co, which consists of a basic water plant and 122 miles of distribution lines. An additional 80 miles of distribution piping will complete the project. The source of supply is the Olentangy River, the water of which is hard and contains iron. A processing plant was built using the usual processes of coagulation, sedimentation, and filtration. Initially it will handle 1 1/4 mgd, but can be expanded to 3 mgd. An O-ring joint system connects the vinyl pipes. (Merritt-FIRL)
W74-09519

WATER SUPPLY IMPROVEMENT PROJECT,
Ohio Dept. of Health, Columbus. Div. of Sanitation.
For primary bibliographic entry see Field 5B.
W74-09542

ULTRAFILTRATION WATER TREATMENT,
Dorr-Oliver Inc., Stamford, Conn.
C. V. Smith, and D. Di Gregorio, Jr.
In: Membrane Science and Technology; Proceedings of Symposium held at the Columbus Laboratories of Battelle Memorial Institute, October 20-21, 1969, Columbus, Ohio: Plenum Press, New York, N.Y., p 209-219, 1970 (second printing 1973). 9 fig, 2 tab.

Descriptors: *Filtration, *Membrane processes, *Water treatment, Pores, Water quality, Water purification, Filters, Membranes, Reverse osmosis.
Identifiers: *Ultrafiltration.

Ultrafiltration is a sieving operation in which membrane pore size is the principal determinant in the separation mechanism. This approach is in contrast to reverse osmosis, in which diffusion is the main mechanism. Ultrafiltration membranes are noncellulosic organic polymers having an asymmetric, extremely thin (5-micron) surface layer or skin and a porous substructure of the same material. The total membrane thickness is only 6 to 8 mils; consequently, to handle the 20 to 50 psi used in water treatment, the membranes are reinforced for added mechanical support. Separations take place at the membrane surface, not within the substructure. (See also W74-09633) (Knapp-USGS)
W74-09636

PUBLIC WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W74-09640

WASTEWATER RECLAMATION: SOCIO-ECONOMICS, TECHNOLOGY, AND PUBLIC ACCEPTANCE.
Ralph Stone and Company, Inc., Los Angeles, California.
For primary bibliographic entry see Field 5D.
W74-09662

CHEMISTRY OF MODERN WATER CHLORINATION, I, INTRODUCTION, II, THE CHEMISTRY OF CHLORINATION,
Newcastle and Gateshead Water Co., Newcastle-upon-Tyne (England).
For primary bibliographic entry see Field 5D.
W74-09744

CHEMISTRY OF MODERN WATER CHLORINATION, III, DISINFECTION BY CHLORINE, IV, CHLORINATION OF WASTE-WATER AND INDUSTRIAL WATERS,
Newcastle and Gateshead Water Co., Newcastle-upon-Tyne (England).
For primary bibliographic entry see Field 5D.
W74-09745

MERCURY REMOVAL BY CONVENTIONAL WATER-TREATMENT TECHNIQUES,
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
G. S. Logsdon, and J. M. Symons.
Journal of the American Water Works Association, Vol 65, No 8, p 554-562, August 1973. 18 fig, 19 ref.

Descriptors: *Mercury, *Water treatment, *Water purification, *Potable water, Laboratory tests, Inorganic compounds, Organic compounds, Testing procedures, Water quality, Coagulation, Filtration, Water softening, Adsorption, Activated carbon, *Ohio River.

Three types of water were used in a study of mercury removal using techniques now employed by many water-treatment plants: raw Ohio River water, treated Ohio River water, and untreated ground water. Mercuric chloride or methyl mercury chloride was added in solution. Coagulation, turbidity removal, carbon adsorption, bentonite adsorption, softening and sand filtration were tested for Hg removal. Removal of mercury by all methods except activated carbon was more efficient when the mercury was in the inorganic form. The relationship between removal of mercury by turbidity removal, coagulation and softening suggests a major role for adsorption of mercury onto suspended matter in the removal of mercury from water. In the case of low turbidity, ferric sulfate was more effective than alum coagulation. Removal by coagulation and softening showed little dependence on mercury concentration in the range 3-16 micrograms/l. Removal by activated carbon adsorption was a function of powdered carbon dose. As long as raw water mercury levels remain low, existing technology should be adequate for removing mercury. (Jernigan-Vanderbilt)
W74-09773

REMOVAL OF ARSENIC (V) FROM WATER BY ADSORPTION ON ALUMINUM AND FERRIC HYDROXIDES,
Illinois Univ., Urbana. Dept. of Civil Engineering.
J. H. Gulledge, and J. T. O'Connor.
Journal of the American Water Works Association, Vol 65, No 8, p 548-552, August 1973. 3 fig, 6 tab, 15 ref.

Descriptors: *Arsenic compounds, *Water pollution, *Water treatment, *Adsorption, Laboratory tests, Coagulation, Toxins, Iron compounds.
Identifiers: *Alum, *Ferric hydroxide.

Arsenic removal from drinking water at water-treatment plants was observed as a function of pH and coagulant dose. The experimental results, expressed as the percentage removal of arsenic (V), showed the arsenic adsorption on ferric hydroxide exceeds the adsorption on aluminum hydroxide. In both cases, increased coagulant dosage resulted in increased arsenic removal. The results also indicated that arsenic removal is somewhat pH dependent. Although there was little difference in arsenic removals at the lower pH reactions, a noticeable decrease in removal was observed at pH 8.0 for both ferric and aluminum coagulants. It appears that the pH became important because of the change in the ionic form of the arsenic (V). Sources and the influence of arsenic as a nutrient and as a poison are discussed. (Jernigan-Vanderbilt)
W74-09775

STUDY OF ARSENIC REMOVAL FROM DRINKING WATER,
Taiwan Inst. of Environmental Sanitation, Taipei. Water Quality Control Section.
Y. S. Shen.
Journal of the American Water Works Association, Vol 65, No 8, p 543-548, August 1973. 1 fig, 21 tab, 7 ref.

Descriptors: *Arsenic compounds, *Water pollution, *Public health, *Water purification, Contaminants, Deep wells, Laboratory tests, On-site tests, Potable water, Heavy metals.

The content of arsenic (0.6-2.0 mg/l) in the drinking water in some parts of Taiwan has been linked to black-foot disease. Lab experiments including plain sedimentation, ion exchange, coagulation, oxidation and coagulation, and filtration tests showed that if arsenic-containing water is oxidized with chlorine, coagulated with ferric chloride, and then filtered, the finished water can be kept free from arsenic for a long period without saturating the filter medium. Field experiments were as follows: (1) raw water was aerated, allowed to settle, and filtered, (2) raw water was aerated, dosed with alum coagulant, allowed to settle, and filtered, (3) same as Exp. 2, but ferric chloride was substituted for alum, (4) same as Exp 3, but chlorine was added during aeration. The fourth field experiment produced an arsenic-free finished water. Based on the results of these experiments, a water plant was built to serve 1500 people. The plan contains an aeration tower, a mixer, a sedimentation tank, two slow sand filters, a storage tank, an elevation tank and a sand washing basin. (Jernigan-Vanderbilt)
W74-09776

5G. Water Quality Control

DESIGN OF PROTOTYPE MASS MEDIA PROGRAMS FOR TESTING IN THE LOWER JAMES RIVER BASIN,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 6B.
W74-09252

REPORT ON GREAT LAKES WATER QUALITY FOR 1972.
International Joint Commission-United States and Canada.
1973. 30 p, 1 map.

Descriptors: *International Joint Commission, *Federal government, *Grear Lakes, *Water quality, Water quality control, Legal aspects, Waste water treatment, Water pollution treatment, Administration, Budgeting, Water resources, Decision making, Eutrophication, Water pollution effects, Social aspects, Phosphorous, Regulation, Project planning, Specifications, Foreign countries, United States, Canada.

The international commission on Great Lakes water quality could not fully discharge their assigned responsibilities under the agreement until each country gave adequate and timely support. Canada has delayed staffing whereas the United States has provided insufficient funding. The Canada-Ontario agreement for municipal waste treatment will meet the Canadian obligation for water quality control. The U.S. will meet its obligations only if larger monetary allotments are made. The commission recommends that each government accelerate the enforcement of industrial waste treatment programs and concludes that the limitations on phosphorous in detergents and programs for phosphorous elimination at treatment plants have already resulted in the reduction of phosphorous loadings to the lower lakes. This is noteworthy because of the key role phosphorous plays in causing eutrophication. The commission urges that responsible officials in both countries formulate programs to ensure the provision of adequate receiving, pump-out, facilities for pleasure and commercial vessels. Though further degradation of water quality may have been slowed, there is no scientific basis to judge the extent of the improvement except in localized areas. (Sperling-Florida)
W74-09257

ENVIRONMENTAL STATEMENTS--ENGINEER REGULATIONS ON PREPARATION AND COORDINATION.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-09258

CLEAN WATER--A CHALLENGE TO THE NATION, HIGHLIGHTS AND RECOMMENDATIONS OF THE NATIONAL CONFERENCE ON WATER POLLUTION.
Public Health Service, Washington, D.C.
Public Health Service Publication No 816 (December 1960). 48 p, 16 photo.

Descriptors: *Water pollution, *Water pollution control, *Water quality, *Water quality control, *Conferences, Water pollution treatment, Water pollution effects, Water pollution sources, Water resources, Regulation, Water resources development, Governments.

In 1960, President Eisenhower called together the National Conference on Water Pollution to discuss and evaluate the problems facing the nation in the area of water pollution and to make recommendations on how to meet those problems. Highlights of the Conference are presented. Four panel groups were established to study four basic areas of concern in the field of water pollution. These areas were: the effect of pollution on the Nation's health, welfare and economy; the importance of water pollution control on the management of water resources; the responsibilities of government, industry, agriculture and the public in combating pollution; and the need for research and professional training. Excerpts from the reports of each panel are presented along with the remarks of various persons who addressed the Conference. The recommendations of the Conference are outlined. (Flowers-Florida)
W74-09260

REPORT OF PROCEEDINGS CONCERNING THE RECLASSIFICATION OF VARIOUS STREAMS IN NORTH CAROLINA, SECTION III, KINSTON PUBLIC HEARING MARCH 1, 1973.
North Carolina Board of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 4A.
W74-09275

REPORT OF PROCEEDINGS CONCERNING THE RECLASSIFICATION OF VARIOUS STREAMS IN NORTH CAROLINA, SECTION II, SOUTHERN PINES PUBLIC HEARINGS NOVEMBER 2, 1972.
North Carolina Board of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 4A.
W74-09276

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09278

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES (FINAL ENVIRONMENTAL STATEMENT).
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09279

UTAH ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSE: PART 1,
Environmental Protection Agency, Denver, Colo. Region VIII.
J. W. Raisch.
Utah Law Review, Winter 1972, p 479-490. 90 ref.

Descriptors: *Utah, *Rivers, *Lakes, *Water quality control, *Waste water treatment, Waste water disposal, Environmental sanitation, Aesthetics, Social aspects, Farm wastes, Return flow, Water pollution sources, Water conservation, Water sources, Water supply, Municipal wastes, Industrial wastes, Turbidity, Water pollution effects, Water quality, Recreation, Waste water(Pollution), Population.
Identifiers: Hazardous substances(Pollution).

The most significant environmental problem facing Utah is derived from population growth and urbanization. Utah's major water quality problems are pollution of several rivers and lakes, including the Great Salt Lake, each basically caused by expanding population and industry. Most usable water originates in the mountains and as it flows it becomes subject to degradation by agricultural and recreational activities. Twenty-two waste treatment plants discharge domestic waste water from 650,000 persons. The most salient problems are caused by organic materials being discharged by overloaded and poorly operated municipal waste water treatment plants. Oil, farm wastes, and a low flow are compounding the problem. Utah Lake suffers from turbidity which is attributable to shallowness and domestic and industrial discharges. Agricultural return flow is a contributing factor. Nine waste water treatment plants and three industrial plants are also discharging into the lake. One-hundred and fifty square miles of the lake do not meet 1978 water quality standards. (Sperling-Florida)
W74-09282

PROTECTING AMERICA'S ESTUARIES: FLORIDA (PART 2).
Hearings---Subcomm of the Comm on Government Operations, U.S. House of Representatives, 93d Cong, 1st Sess, May 26, 1973. 672 p.

Descriptors: *Water resources development, *Environmental effects, *Estuaries, *Ecology, *Pollution abatement, *Florida, Economics, Saline water-freshwater interfaces, Estuarine environment, Environmental engineering, Water quality, Water pollution, Water pollution effects, Legislation, Water demand.
Identifiers: *Congressional hearings.

The first portion of the hearings consisted of testimony from witnesses from Federal, State and local levels of government and the second was comprised of witnesses from private organizations, such as the Audubon Society, Sierra Club, and the Environmental Policy Center. Statements and testimony from various business men and concerned individuals, who feel the environment should be of primary concern, are included. Displeasure was expressed over federal legislation, and also over big business' attitude, concerning environment and ecology. Along with testimony, about 20 statements, and several letters were submitted for the record. Literature concerned with the prevention of oil spills from federally leased facilities in the Gulf and other Outer Continental Shelf areas is presented as is material submitted for the record by the private organizations in their testimony. (See also W74-06010) (Sutton-Florida)
W74-09283

AIR, LAND AND WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W74-09289

DRAINAGE--SEWAGE DISPOSAL; CONTAMINATION OF LAKE MICHIGAN.
For primary bibliographic entry see Field 6E.
W74-09292

SANITARY DISTRICTS.
For primary bibliographic entry see Field 6E.
W74-09294

FISH PROTECTIVE REGULATIONS.
For primary bibliographic entry see Field 6E.
W74-09295

PROTECTION AND IMPROVEMENT OF WATERS: POLLUTION CONTROL.
For primary bibliographic entry see Field 6E.
W74-09300

SEDIMENTATION POLLUTION CONTROL ACT OF 1973.
For primary bibliographic entry see Field 6E.
W74-09303

CONTAMINATION OF WATERS.
For primary bibliographic entry see Field 6E.
W74-09304

RIGHT OF PRIVATE PARTY TO MAINTAIN ACTION TO ENFORCE PROVISIONS OF RIVERS AND HARBORS ACT OF 1899,
For primary bibliographic entry see Field 6E.
W74-09305

LIABILITY OF WATER SUPPLIER FOR DAMAGES RESULTING FROM FURNISHING IMPURE WATER,
For primary bibliographic entry see Field 6E.
W74-09306

A BILL TO AMEND THE OUTER CONTINENTAL SHELF LANDS ACT AND TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO REGULATE THE CONSTRUCTION AND

OPERATION OF DEEPWATER PORT FACILITIES,
For primary bibliographic entry see Field 6E.
W74-09311

A BILL TO AMEND THE OIL POLLUTION ACT, 1961 (75 STAT. 402), AS AMENDED TO IMPLEMENT THE 1969 AND 1971 AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF THE POLLUTION OF THE SEA BY OIL, 1954, AS AMENDED; AND F OR OTHER PURPOSES,
For primary bibliographic entry see Field 6E.
W74-09312

A BILL TO ASSURE THAT THE PUBLIC IS PROVIDED WITH SAFE DRINKING WATER, AND FOR OTHER PURPOSES.
For primary bibliographic entry see Field 6E.
W74-09314

AUDUBON BLACK PAPER NUMBER 1, OIL POLLUTION,
For primary bibliographic entry see Field 5C.
W74-09315

RECENT FEDERAL LEGISLATION SIGNIFICANT IN ENVIRONMENTAL PLANNING PROGRAMS OF THE STATE OF TEXAS.
Texas Law Inst. of Coastal and Marine Resources, Houston.
For primary bibliographic entry see Field 6E.
W74-09316

SANITATION AND PUBLIC HEALTH PLANNING,
Escola Nacional de Saude Publica e de Medicina Tropical, Lisbon (Portugal).
H. X. A. Pedrosa.
An Esc Nac Saude Publica Med Trop. Vol 5, No 1/2, p 149-153. 1971.
Identifiers: Human population, *Planning, *Portugal, *Public health, *Sanitation, Sewer systems, Regulation, Waste disposal, Water quality standards.

In planning public health services in Portugal, the central government can subsidize and guide the local health departments. The district of state governments should determine the major outlines of sanitary policy, set up regulations and supervise the local agencies or health centers, which in the long run determine the effectiveness of the program. To handle the expanding need for public health services and new policies, the formation of a public health service company, by government and private sources, is suggested. It would be responsible for planning, building and operating water and sewer services in cooperation with local governments, and promoting research and technical, economic, sanitary and financial studies. The provision of water and sewer disposal are the most urgently needed services, since 78% of the population lives in rural areas and small communities which cannot afford the cost of building or operating such services. Of the total population of the country, 70% do not have piped water, 78% do not have public sewer systems, 22% do not have a bathrooms and 56% do not have toilets.--Copyright 1974, Biological Abstracts, Inc.
W74-09317

A SUMMARY-DIGEST OF FEDERAL WATER LAWS AND PROGRAMS,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 6E.
W74-09318

TEST AND EVALUATION OF OIL POLLUTION ABATEMENT DEVICES FOR SHIPBOARD USE, PHASE 3,
Coast Guard, Washington, D.C. Naval Engineering Div.
L. B. Norton.
Available from NTIS, Springfield, Va 22151 AD-762 488 Price $3.00 printed copy; $1.45 microfiche. Phase 3 Final Report, January 1973. 16 p, 1 fig.

Descriptors: *Oily water, *Separation techniques, *Emulsions, *Oil pollution, Water pollution control, Water treatment, Waste water treatment, Filtration.

A separator system for oily water was tested for both bilge and ballast service on a 210 ft U.S. Coast Guard cutter. The capacity of the filter-coalescer system was 100 gpm. The effluent was monitored by an on-line infrared absorption type monitor. The alarm points were set to recirculate water effluents exceeding 20 mg per liter. Bilge mixtures were processed both at sea and in port. Normal water effluent oil concentrations were 12 to 20 mg per liter. Ballast mixtures were processed in port. A maximum of 5 mg per liter was discharged overboard during this procedure. Most emulsions were separated satisfactorily. The separated oil product from both bilge and ballast emulsions was used in the ship's main propulsion diesel engines and auxiliary boilers. (Knapp-USGS)
W74-09321

VACUUM DESORPTION CONCEPT FOR REMOVING OIL FROM WATER,
Mechanics Research, Inc., Los Angeles, Calif.
G. M. Pomonik.
Available from NTIS, Springfield, Va 22151 as AD-764 447, Price $4.25 printed copy; $1.45 microfiche. Final Report, to Coast Guard Office of Research and Development, March 1973. 107 p, 32 fig, 11 tab.

Descriptors: *Separation techniques, *Oily water, Water pollution control, Oil spills, Oil pollution, Bubbles, Flotation, Froth flotation, Gases, *Pollution abatement.
Identifiers: *Vacuum desorption.

A prototype working model was developed of a separator for the removal of oil from bilge and ballast water aboard ships and tanks. The concept involves desorption of gas from the water by means of a vacuum. The bubbles thus formed aid the separation process by forming on particles in the water and rapidly raising them to the surface. Tests include design, development and fabrication of a prototype unit to study the capabilities of the system with a variety of oil types and input conditions. The results were projected to a full scale shipboard installation. (Knapp-USGS)
W74-09323

UNDERGROUND INJECTION OF WASTEWATERS IN THE OHIO VALLEY REGION.
Ohio River Valley Sanitation Commission, Cincinnati. Committee on Subsurface Industrial Wastewater Injection,
Available from ORSANCO, 414 Walnut St, Cincinnati, Ohio 45202, Price $3.00 per copy. Ohio River Valley Water Sanitation Commission (ORSANCO) Report, August 1973. 63 p, 14 fig, 6 tab, 21 ref.

Descriptors: *Waste water disposal, *Injection wells, *Waste disposal wells, Ohio River, Indiana, Ohio, New York, Pennsylvania, West Virginia, Kentucky, Illinois, Hydrogeology, Regulation, Interstate commissions.
Identifiers: *Ohio River Valley.

Recommended administrative procedures for regulation of wastewater injection wells in the Ohio Valley are outlined. The geological and technological aspects to be considered in preparing and evaluating proposals, and for guiding the construction, operation and abandonment of injection systems are discussed. Areas where subsurface waste injection is indicated as being of only limited feasibility are those where no aquifers containing more than 1,000 mg/liter of dissolved solids are available; the saline-water-bearing sedimentary sequence is less than 1,500 ft thick; and structural geologic conditions are considered sufficiently complex to cause great uncertainty about subsurface hydrology. A foremost consideration in evaluating the feasibility of deep-well injection is the character of the untreated wastewater. Waste volumes should be small. Quantities greater than a few hundred gallons per minute are generally too great for injection into a single well in the Ohio Valley. (Knapp-USGS)
W74-09324

WASTE MANAGEMENT: GENERATION AND DISPOSAL OF SOLID, LIQUID AND GASEOUS WASTES IN THE NEW YORK REGION,
Regional Plan Association, N.Y.
B. T. Bower, G. P. Larson, A. Michaels, and W. M. Phillips.
A report of the Second Regional Plan, New York. March 1968. 107 p, 20 fig, 19 tab, photos, append.

Descriptors: *Waste disposal, *Alternate planning, Institutional constraints, Political aspects, Waste identification, Wastes, Waste treatment, Regulation, *Liquid wastes, *Solid wastes, *Gases, New York.
Identifiers: *Waste management, *New York City.

While specifically focusing on waste management in the 31-county New York Metropolitan Region, this report delineates a process for developing waste management policies applicable to any metropolitan area. The process has 4 steps: (1) projections of total population and employment for the Region to the year 2000; (2) selection of different distributions of total population, jobs, and other activities to show the impact of alternate settlement patterns; (3) selection of various 'generation conditions' to analyze the effects of factors contributing to waste production which yield assumed quantities of waste that will be generated; (4) choice of 'management conditions' to show the impact of different techniques and policies for handling and disposing of the generated wastes. Given this analytical framework, the costs and benefits of alternative policy proposals can be evaluated. It is concluded that, given comprehensive analysis of the entire waste management system (beginning with waste generation) and policy control over the entire region, projected waste quantities are manageable and do not seem so economically burdensome as to require efforts to limit population growth. Implications for governmental organization of waste management are also explored. (Hoffman-North Carolina)
W74-09353

WATER BALANCE IN SEWAGE STABILIZATION LAGOONS,
North Dakota Univ., Grand Forks. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-09361

BIOLOGY, DISTRIBUTION, IMPORTANCE AND CONTROL OF DEER FLIES AND HORSE FLIES (DIPTERA:TABANIDE) IN WATER-ORIENTED RECREATIONAL AREAS,
Clemson Univ., S.C. Dept. of Entomology and Economic Zoology.
T. R. Adkins, Jr.
Available from the National Technical Information Service as PB-233 435, $5.50 in paper copy, $1.45 in microfiche. Report No. 42, South Carolina Water Resources Research Institute, Clemson, April 1974. 172 p, 40 tab, 88 fig, 18 ref. OWRR A-020-SC(14).

Descriptors: *South Carolina, *Insect control, Insect behavior, Recreation, *Insects, Control, Carbon dioxide, Distribution, *Diptera.
Identifiers: Tabanids, *Tabanidae, *Horse Fly, *Deer Fly, Biting flies, Insect Traps, Chrysops, Tabanus, Ultra-lot-volume.

A survey of biting flies affecting water-oriented recreation in South Carolina revealed that at least 114 species and subspecies of tabanids are present. A plastic canopy trap was devised for monitoring tabanid activity; these traps show promise as control agents in small areas (i.e., around swimming pools). Temporary control of tabanids was obtained with malathion applied either by airplane or by ULV ground equipment. Short-term control was obtained because of fly-in or emergence of new flies. Carbon dioxide was a very efficient attractant for tabanids. Several types of plastic and wood traps were tested for their ability to capture tabanids. The plastic canopy trap with a black decoy sphere captured more of a greater variety of tabanid species than the other traps.
W74-09363

HYDROGEOLOGY OF THE FORMATION AND NEUTRALIZATION OF ACID WATERS DRAINING FROM UNDERGROUND COAL MINES OF WESTERN MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 5B.
W74-09369

HELICOPTER TOW TESTS OF THE U.S. COAST GUARD'S AIR DELIVERY CONTAINER FOR OIL SPILL CONTAINMENT BARRIER,
Naval Coastal Systems Lab, Panama City, Fla.
J. R. Kennedy.
Available from NTIS, Springfield, Va. 22151, as AD-774 898, Price $3.00 printed copy; $1.45 microfiche. Informal Report NCSL 198-73, December 1973. 18 p, 5 fig, 2 append. MIPR: Z-70099-4-41543.

Descriptors: Oil spills, *Oily water, Water pollution control, *Oil pollution, Aircraft, *Separation techniques, *Pollution abatement.
Identifiers: *Oil spill barriers, Helicopters.

An oil spill barrier with its air delivery packing container was successfully towed by a Navy H-53 tow-equipped helicopter. Flight tow tests were conducted to demonstrate feasibility, develop any required special equipment, and provide data for similar Coast Guard tests. (Knapp-USGS)
W74-09374

ENVIRONMENT: A NEW FOCUS FOR LAND-USE PLANNING.
National Science Foundation, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09412

ECOLOGICAL CONCEPTS AND APPLICATIONS TO PLANNING,
Michigan State Univ., East Lansing. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W74-09418

AN EVALUATION OF THE IMPACT OF LAND USE ON ENVIRONMENTAL QUALITY,
Argonne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 4A.
W74-09419

AN OBJECTIVE WATER QUALITY INDEX,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
R. D. Harkins.
Journal Water Pollution Control Federation, Vol 46, No 3, p 588-591, March 1974. 1 tab, 2 ref.

Descriptors: *Statistical methods, *Water quality standards, Data processing, Mathematical studies, Water analysis, Analysis, Probability, Water pollution.
Identifiers: *Water quality index.

An objective statistical procedure for combining several water quality parameters to arrive at a water quality index is described. These indexes are directly comparable and may be plotted to show time trends or station differences or analyzed statistically to obtain probability levels. The index is suitable for summarizing water quality and determining overall trends, but it does not replace careful analysis of individual parameters to determine potential sources of pollution problems. (Witt-IPC)
W74-09436

FULL-SCALE HARVEST OF AQUATIC PLANTS: NUTRIENT REMOVAL FROM A EUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
S. A. Peterson, W. L. Smith, and K. W. Malueg.
Journal Water Pollution Control Federation, Vol 46, No 4, p 697-707, April 1974. 5 fig, 6 tab, 27 ref.

Descriptors: Aquatic plants, *Aquatic weed control, *Municipal wastes, Water pollution effects, *Phosphorus, *Nutrient removal, Lakes, Harvesting, Water quality control, *Eutrophication, Water chemistry, Water quality, Water pollution, *Minnesota, Water pollution sources, Waste water(Pollution).
Identifiers: *Lake Sallie(Minn), Detroit Lakes(Minn).

A study was made of the nutrient input and content of Lake Sallie, Minnesota. The prime nutrient source to the lake was pinpointed as the waste water outfall from the city of Detroit Lakes, Minn. After determining the nutrient balance for the lake, aquatic plants were harvested for 3 months from the entire littoral zone of the lake. A reevaluation of the nutrient balance of the lake was made to determine the effects of aquatic plant harvesting. The study showed that a full-scale harvesting program was not sufficient to offset the high phosphorus loading in the lake. The harvesting program was able to remove only 1.37% of the total phosphorus input to the lake. (Witt-IPC)
W74-09438

AQUATIC MIDGE LARVICIDES, THEIR EFFICACY AND RESIDUES IN WATER, SOIL, AND FISH IN A WARM-WATER LAKE,
California Univ., Riverside. Dept. of Entomology.
M. S. Mulla, R. L. Norland, W. E. Westlake, B. Dell, and J. St. Amant.
Environ Entomol, Vol 2, No 1, p 58-65, 1973, Illus.
Identifiers: *Aquatic insects, Carbaryl, Chironomus, Chlorpyrifos, Cricotopus, Dicrotendipes, Fenitrothion, Fish, Lakes, *Larvicides(Midges), *Midges, Soils, Tanypus, *California.

To study the efficacy of chemical larvicides, several materials were evaluated in 2 warm-water southern California artificial lakes, (lake Calabasas and Westlake), and the residues of an effective larvicide (chlorpyrifos) in various components of 1 of the lakes were investigated. Abate (O,O'-(thiodi-p-phenylene) O,O,O', O'-tetramethyl phosphorothioate) gave excellent control of Chironomine midges, but only poor control of the smaller Tanypodine midges. Carbaryl yielded poor control of both groups, and fenitrothion yielded good control of both groups at a higher rate of application. Chlorpyrifos at 0.2 lb active ingredients per acre-surface yielded complete control of Chironomine midges for 12 wk or longer, but suppressed the Tanypodine larvae for only 7-8 wk. Residues of chlorpyrifos were generally higher in the bottom water, even though maximum residues in both layers reached 0.6 ppb. Residues were much higher in the mud, reaching a mean maximum of 0.3 ppm in the top 1-inch section of mud samples, but only traces were found in the remaining mud. Maximum residues in water were obtained one day after treatment, declining to below 0.1 ppb within 4 wk after treatment. The maximum residues in the mud were obtained 1 wk after treatment, declining to below 0.1 ppm in 28 days. Slightly higher levels of residues were found in water and mud when the whole lake was treated. Bottom-dwelling and -frequenting fish, such as channel catfish and, to some extent, black crappie contained much higher quantities of chlorpyrifos than the nonbottom dwelling fish such as largemouth bass and bluefill. Mean maximum residues in channel catfish and black crappie were 0.8 and 0.5 ppm after 3 and 2 wk posttreatment, respectively, declining to barely detectable levels 25 days after treatment. The residues in largemouth bass and bluegill were minimal, with maximum approaching 0.2 ppm but remaining 0.1 or below this level most of the time.--Copyright 1973, Biological Abstracts, Inc.
W74-09443

CLEANING UP: PAPER INDUSTRY'S MESS,
J. Josephson.
Environmental Science and Technology, Vol 8, No 1, p 22-24, Jan, 1974. 1 fig, 2 tab.

Descriptors: *Pollution abatement, *Pulp and paper industry, *Pulp wastes, *Water pollution control, *Air pollution, *Water quality standards, *Legal aspects, *Regulation, *United States, *Legislation, Water quality act, Federal Water Pollution Control Act, Effluents, Costs, Capital costs, Operating costs, Waste water treatment, Water quality control, Industrial wastes, Waste water(Pollution), Water pollution sources.

The major water pollutions discharged by the U.S. pulp and paper industry are listed and their origins are indicated. While the EPA is preparing new effluent guidelines for aqueous emission control, regulations set forth in the 1972 Amendments to the Federal Water Pollution Control Act require all existing mills to use the best practicable control technology available by July 1977 and the best available technology economically achievable by July 1983, with a zero-discharge goal set for 1985. Air emission standards about to be formulated will probably resemble those already prepared for Europe's paper industries. Methods of reducing water and air pollution loads issuing from pulp and paper mills are summarized, and the marketing of by-products to help recovery part of the effluent-treatment costs is discussed. Interim standards for limiting water pollutants are presented, and water pollution abatement expenditures for various kinds of mills through 1980 are estimated. (Buchanan-IPC)
W74-09458

DISCHARGE COEFFICIENTS OF FLOAT-AREA-TYPE FLOW METERS,
Tokyo Science Univ. (Japan).
For primary bibliographic entry see Field 2E.
W74-09480

COMPUTER DATA FLOWS SMOOTHLY FOR SMALL WATER AUTHORITY,
Monroeville Water Authority, Pa.
For primary bibliographic entry see Field 6C.
W74-09483

NUTRIENTS AND AQUATIC VEGETATION EFFECTS,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
For primary bibliographic entry see Field 5C.
W74-09498

SOME HISTORICAL STATISTICS RELATED TO FUTURE STANDARDS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5D.
W74-09505

SOME PRACTICAL ASPECTS CONCERNING THE USE OF THE MOLLUSCICIDE N-TRITYLMORPHOLINE (FRESCON) FOR THE CONTROL OF FASCIOLIASIS,
Shell Research Ltd., Sittingbourne (England). Woodstock Agricultural Research Centre.
For primary bibliographic entry see Field 5C.
W74-09525

DIGGING INTO MINE WASTE.
For primary bibliographic entry see Field 5B.
W74-09531

ROAD SALT, DRINKING WATER AND SAFETY,
Little (Arthur D.), Inc., Cambridge, Mass. Public Affairs Center.
For primary bibliographic entry see Field 4C.
W74-09537

PREVENTING LANDFILL LEACHATE CONTAMINATION OF WATER,
Gulf South Research Inst., Baton Rouge, La.
E. J. Wren.
Available from the National Technical Information Service as PB-222 468, $4.25 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-73-021, July 1973. 113 p, 37 fig, 10 tab.

Descriptors: Pollution, Industrial wastes, *Tests, *Waste disposal, Water pollution, Surveys, *Sanitary engineering, Sealers, Soil properties, Sampling, Contamination.
Identifiers: Solid waste disposal, Resource recovery, Commercial materials, *Sanitary landfill sealants, Synthesized garbage-simulating, *Leachate, Test pits, *Municipal refuse.

Available commercial materials and industrial waste products that could possibly be used as sanitary landfill sealants were tested in elemental test columns (with the use of synthesized garbage) that simulated field conditions. These materials were then applied to small field test pits filled with municipal garbage. The test pits were equipped with sampling wells, within and around each pit, to monitor any leachate which escaped from the cells. The analytical parameters (BOD, COD, and others) were compared with baseline data obtained from local area wells to determine the degree of effectiveness of the test materials. (Martino-NWWA)
W74-09539

UNIVERSITY STUDENTS IMPLEMENT PUBLIC POLICY RURAL COMMUNITY ACTION WITH A WATER DEVELOPMENT PROJECT,
Case Western Reserve Unit., Cleveland, Ohio. Urban and Environmental Studies.
D. G. Montgomery.
Water Resources Bulletin, Vol 9, No 6, p 1258-1265, 1973. 3 ref. HUD P-299-9217 (CWRU).

Descriptors: *Rural areas, *Financing, *Water supply, Sewage treatment, Government finance, Local governments, Federal government, State governments, *Ohio.
Identifiers: *Rock Creek(Ohio).

For more than ten years the small rural village of Rock Creek, Ohio has sought state and federal financial assistance to improve its water and sewage facilities. The existing water system is without filters and is not metered. The activities of the village and of eight student members of the Urban and Environmental Studies Program at Case Western Reserve University in a ten-week seminar in their search for financial assistance are described. The impact of the village's small size, the characteristics of its population, its choice to remain incorporated, its isolation from major transportation routes, its inability to raise funding shares as required by governmental programs and its present indebtedness on its ability to qualify for state and federal programs are examined. Recommendations for future financial assistance are presented. It was also recommended that greater communication between the state governmental agencies and local communities be fostered, a government information clearing house be established, increased research into alternative governmental solutions to rural problems and an ombudsman be established to aid communication. (Schroeder-Wisconsin)
W74-09557

CAPITAL BUDGETING FOR POLLUTION CONTROL,
A. D. Mikhail.
Journal of General Management, Vol 1, No 1, p 32-44, 1973. 15 tab, 7 ref.

Descriptors: *Budgeting, *Pollution abatement, *Industrial wastes, *Cost-benefit analysis, Capital costs, Monetary benefits, Investment, Industries, Oil industry, Pulp and paper industry, Electric power industry, Steel, Economic justification.
Identifiers: Accounting procedures, Capital expenditures.

Capital budgeting practices to achieve pollution control are examined for the electric utility, steel, integrated domestic oil, and paper and pulp industries. The industrial sample was selected from firms listed in Fortune's Directory of the 500 largest corporations and in Standard and Poor's 'Industrial Survey' with questionnaires submitted to the selected firms' chief financial officers. Of 146 questionnaires sent 27, 8, 11, and 13 responses, respectively, were returned. The distribution of industry respondents are categorized by the 1970-72 relative size of pollution control expenditures, relative size of capital expenditures and reported length of the pollution control project's useful life. Results from the survey indicate that some industries can identify and measure a number of pollution abatement benefits including higher production yields and additional saleable byproducts. For the electrical industry, reduced litigation costs were also cited. Respondents, excluding steel, indicated that abatement benefits tended to be long run in nature. Less certain benefits--improved corporate image and workers' morale--were also noted. While a majority of respondents concluded that traditional cost-benefit analysis is inadequate in selecting abatement procedures, a resonable number utilized the cost-benefit analysis in varying degrees while still placing major emphasis on executive judgement. (Schroeder-Wisconsin)
W74-09558

EFFLUENT CHARGES: A CRITIQUE,
Pennsylvania Univ., Philadelphia. Wharton School.
S. Rose-Ackerman.
Canadian Journal of Economics, Vol 6, No 4, p 512-528, 1973. 5 fig, 20 ref.

Descriptors: *Pollution taxes(Charges), *Effluents, *Decision making, Water pollution control, Regulation, Marginal costs, Marginal benefits, Cost allocation, Waste treatment, Progressive taxes, Regressive taxes, Payment.

The many arguments favoring the imposition of effluent charges to control pollution often are the result of reliance upon models that do not consider the complexity of the real world problems faced by decision makers. When such complexities are operationalized into the earlier models it can often be shown that comparable non-market regulations may be at least as efficient as effluent charges. Among the real world complexities evaluated are cost of information, intensity of pollution investment, collusive behavior among dischargers, discontinuities in marginal cost and benefit schedules, the existence of differing marginal damage functions among pollutors, and cases when joint treatment by dischargers may result in an efficient outcome. Under effluent charges it is shown that some dischargers may be forced out of business, even though their operation may be justified when comparing marginal social costs and benefits, joint treatment facilities may be located in the 'wrong' place, and long term adjustment periods may lead to continued over or under treatment. While it is conceded that non-market schemes often face more difficult problems, it is equally important to realize that effluent charges do not represent a panacea. (Schroeder-Wisconsin)
W74-09560

CONTROLLING POLLUTION BY PRICE AND STANDARD SYSTEMS: A GENERAL EQUILIBRIUM ANALYSIS,
Williams Coll., Williamstown, Mass.
T. H. Tietenberg.
Swedish Journal of Economics, p 193-203, 1973. 12 ref.

Descriptors: *Pollution abatement, *Equilibrium, *Standards, Prices, Economic efficiency, Welfare(Economics), Pollution taxes(Charges), Control, Resource allocation.

The high information requirements to establish an optimal level of pollution has prompted several economists to accept the setting of pollution levels through the political process. Once the level has been decided the pricing system could be used to allocate the accepted pollution levels among polluters. The case for using the pricing system, either through an auction of pollution rights or through a specific tax depends upon an assumption that a single per unit tax on each type of waste discharge will provide a least-cost solution. The validity of this assumption is tested through a simple mathematical model. The analysis concludes that the theoretical case for a price and standard system rests upon the low transaction costs associated with a uniform tax structure. A uniform tax, however, minimizes the costs of attaining a given standard only when the marginal physical product of a particular pollutant is the same for all emitters, a most unlikely situation. If the area can be broken into zones, this assumption may be justified. The optimal number of zones will be obtained when the marginal transaction costs of administering one more zone equals the marginal gains in resource cost reduction. (Schroeder-Wisconsin)
W74-09561

POLLUTION CONTROL: NEW METHOD OF FINANCING,
Rothschild (L.F.) and Co., N.Y.
R. H. Aldrich, and N. A. Eisner.
Financial Executive, Vol 41, No 10, p 118, 120-121, 1973.

Descriptors: *Pollution abatement, *Financing, *Industries, Bond issues, Capital supply, Taxes.
Identifiers: Pollution control revenue bonds.

An important element in the development of any industrial pollution abatement program is the consideration of financing formats. A full consideration of alternative formats can lead up to a 30% reduction in cost. The newest and most promising financial alternative available is the pollution control revenue bond which in the past 12 months has raised $1 billion of abatement funds. These bonds are successors to the industrial development bond which had aided communities in encouraging industrial development by issuing low-cost tax-exempt revenue bonds. The pollution control bond

has improved local environments, provided low-cost capital, and minimized the economic impact of increased pollution standards on communities. Positive impact on the cost of money, cash flow, internal earning objectives, and availability of funds are indicated. Legislation which allows this form of financing has been or is expected to be enacted in 48 states. The Internal Revenue Service regulation may limit the effectiveness of this financing alternative as presently it limits the bonds' revenue to financing of abatement facilities, collection, storage, reclamation, or disposal of solid wastes. The eligibility requisites for these bonds are outlined. (Schroeder-Wisconsin)
W74-09563

ENVIRONMENTAL DISRUPTION: IMPLICATIONS FOR ECONOMIC PLANNING,
For primary bibliographic entry see Field 6B.
W74-09564

GROUNDWATER QUALITY. DOOR COUNTY, WISCONSIN.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-09565

THE COASTAL INTERCEPTOR WATERWAY,
Miami Univ., Fla.
D. C. Tabb, and E. J. Heald.
Sea Grant Coastal Zone Management Bulletin No 4, January 1973. 10 p, 3 fig, 5 ref. NOAA Sea Grant No 2-35147.

Descriptors: *Water pollution control, *Canals, Florida, Wetlands, Salt marshes, Coasts, Lagoons, Planning, Land use, Urbanization.

To control pollution of coastal wetlands, wide shallow waterways are proposed to intercept nutrients. The interceptor waterway would be unlike traditional coastal development canals. They should be approximately parallel to coastal contours instead of directly into coastal bays. They are designed to intercept and digest upland nutrients irrespective of tide using sunlight, photosynthesis by plants and wind action to eliminate severe eutrophication, stratification, and oxygen depletion. Tidal exchange should not be considered an important facet of the system. The waterways should have a relatively large surface-to-depth ratio, averaging 5 ft or less in depth. Its seaward shore should be completely natural with a few easily hidden structural safeguards built to preserve uniform height of the seaward edge or sill. The waterways should serve best in coastal areas having very low relief and should function equally well in salt-tolerant grass marshes of the south Atlantic and Gulf states or mangrove marshes of Florida. (Knapp-USGS)
W74-09614

INDEPENDENT COMPARISON OF THREE URBAN RUNOFF MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-09629

PHYSICAL AND CHEMICAL CHARACTERISTICS OF SURFACE MINE SPOIL TREATED WITH FLY ASH,
Northeastern Forest Experiment Station, Princeton, W.Va.
For primary bibliographic entry see Field 5B.
W74-09631

OPTIMAL CONTROL OF FLOW IN COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-09652

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER QUALITY MANAGEMENT ON LAKE ERIE: YEAR TWO,
Battelle Columbus Lab., Ohio.
D. L. Hessel.
Available from the National Technical Information Service as PB-233 752, $7.50 in paper copy, $1.45 in microfiche. Completion Report, May 24, 1974. 298 p, 6 fig, 13 tab, 150 ref. 4 append. OWRR C-3382(No 9001)(1).

Descriptors: *Cities, Coordination, *Governmental interrelations, *Institutional constraints, *Lake Erie, Methodology, Municipal wastes, *Organizations, *Management, *Water policy, *Water pollution, Administrative agencies, Administrative decisions, Analysis, Decision making, Federal government, Governments, Great Lakes, Institutions, Legal aspects, Local governments, Management, *Ohio, Political aspects, Political constraints, Regulation, State governments, Suburban areas, United States, Water quality control.
Identifiers: *Institutional analysis, Longitudinal analysis, Waste water management, *Cleveland(Ohio).

The need for a systematic methodology for analysis of institutional systems has been recognized by political scientists. The development of such a methodology, however, has not been possible in the absence of a logically consistent theoretical framework. A multilateral theory recently formulated by Phillip M. Gregg was used as an analytical framework. The theory was employed to identify useful research variables, to derive critical research questions, and to provide explanatory generalizations. This study focused on the system of institutions responsible for waste water management in the Cleveland, Ohio, metropolitan region. The approach was to observe changes in the several research variables over a period of ten years (1963-1973) through use of a longitudinal design. Data were collected in interviews held in 1971 and 1973. The principal variables described institutional structure, institutional products, and institutional performance. The study demonstrated that the multilateral theory is a useful framework for explaining observed institutional phenomena. Accepting the theory on this evidence as an accurate description of real world relationships and principles, the theory was used as a normative tool to suggest directions for future development of the institutions concerned with waste water management for the Cleveland metropolitan area.
W74-09653

WATER RESOURCE PROBLEMS AND RESEARCH NEEDS OF NORTH CAROLINA - A REASSESSMENT,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 6B.
W74-09657

MINIMIZING WATER AND SEWER SYSTEM COSTS USING TOPAZ,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6A.
W74-09658

ECONOMIC IMPACT OF AGRICULTURAL POLLUTION CONTROL PROGRAMS,
Federal Reserve Bank of Kansas City, Mo.
R. J. Doll.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 9-16, (1972). 3 tab, 3 append.

Descriptors: *Agriculture, Technology, *Management, *Economic impact, *Control, *Regulation, Agricultural runoff, Kansas, Feed lots, Farm wastes.
Identifiers: *Agribusiness, Tenth Federal Reserve District.

Flexible regulatory systems governed by enlightened administrations are needed to replace existing uniform pollution control programs for agriculture. These systems should be viable and flexible enough to adequately control the environment without unduly restricting economic growth. An example is pollution caused by runoff of nitrogen-based fertilizers and other chemicals. Such runoff must be brought under control. The real problem is how to minimize such pollution, but, at the same time, permit the efficiencies achieved by technology. The proposal that the amount of a given chemical used per acre should be limited seems an incorrect approach because of the influence of such variables as soil type, climate, topography, method, and time of application, and soil preparation tactics. (See also W74-09663) (Lynch-East Central)
W74-09665

PUBLIC RELATIONS ASPECTS OF AGRICULTURAL WASTE MANAGEMENT,
D. B. Graham.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 17-24, (1972).

Descriptors: *Farm wastes, *Waste treatment, *Recycling, Pollution abatement, Odor, Waste disposal.
Identifiers: *Public relations, *Agricultural Waste Managment.

An overview of animal waste management methods and economic implications is presented to show that the public must be informed about the farmer's pollution problems and solutions. There is a need for public acceptance of farm wastes as a valuable recyclable resource. (See also W74-09663) (Lynch-East Central)
W74-09666

IMPLICATIONS OF THE PERMIT PROGRAM IN THE POULTRY AND ANIMAL FEEDING INDUSTRY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
D. F. Anderson.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 25-45, (1972). 8 fig, 9 tab, 35 ref.

Descriptors: *Waste disposal, *Water pollution treatment, *Water permits, *Feed lots, *Agricultural runoff, *Waste treatment, Water pollution, Water law, Waste water disposal, Livestock, Biochemical oxygen demand, Chemical oxygen demand, Poultry, Farm wastes.
Identifiers: Pollution discharge, Executive Order Number 11574, Zero discharge.

Now in suspension, Executive Order Number 11574 called for the Army Corps of Engineers to assume responsibility for issuing permits for all industrial pollution discharges into navigable streams and their tributaries. Permits for agricultural discharges into waterways were to apply to operations of 1000 animal waste units and larger with violators subject to fines and/or injunction. The proposed national goal was 'zero discharge' by 1985. New methods of meeting discharge requirements such as sedimentation, lagooning, and recycling were proposed. Pollutant concentrations in run-off and water discharge as well as methods of disposing of animal wastes are cited. (See also W74-09663) (Lynch-East Central)
W74-09667

APPLICATION OF IOWA'S WATER POLLUTION CONTROL LAW TO LIVESTOCK OPERATIONS,
Iowa State Dept. of Health, Des Moines.
U. Agena.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 47-59, (1972).

Descriptors: *Regulation, Water law, *Water permits, *Water pollution control, *Farm wastes, *Livestock, *Feedlots, Iowa, Waste disposal, Waste treatment, Inspection, Poultry, Runoff.
Identifiers: Permit requirements, *Iowa Water Pollution Control Law, Rural Environmental Assistance Program(REAP).

In conjunction with the Agricultural Stabilization Conservation Service, the Soil Conservation Service, and the Cooperative Extension Service, the Iowa Water Pollution Control Commission became responsible for prevention, control, and abatement of water pollution in that state in 1965. The commission registers feedlots, evaluates feedlots for pollution potential, and issues permits for waste disposal. Requirements for feedlot registration and regulation based on the number of confined animals and the destination of the runoff water are defined and outlined. (See also W74-09663) (Lynch-East Central)
W74-09668

A REVIEW OF PUBLIC AND PRIVATE LIVESTOCK WASTE REGULATIONS,
Missouri Univ., Columbia.
D. R. Levi.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 61-69, (1972).

Descriptors: *Regulation, *Farm wastes, *Livestock, *Feed lots, *Zoning, *Civil law, Permits, Water pollution, Legal aspects, Contracts, Air pollution, Waste disposal, Pollution abatement.
Identifiers: Public regulation, Private regulation, Licensing law, Injunctions, Site selection.

All states now have very similar public regulatory agencies which control pollution by adhering to precise tolerance mandates. When tolerance levels are exceeded the board may seek an injunction, assess daily fines, institute a lawsuit to recover damages, or issue tax bills for construction of adequate pollution control facilities. Private regulation, uncertain and unpredictable due to dependence on a jury, occurs indirectly in civil lawsuits through the nuisance laws. Under these laws a plaintiff may sue for injunction, damages, or both. Feedlot operators were advised to consider zoning, site selection, and prior occupation in setting up new operations. (See also W74-09663) (Lynch-East Central)
W74-09669

IMPLICATIONS OF STATE ENVIRONMENTAL LEGISLATION ON LIVESTOCK WASTE MANAGEMENT,
Economic Research Service, Washington, D.C. Farm Production Economics Div.
J. B. Johnson, L. J. Connor, C. R. Hoglund, and J. R. Black.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 71-81, (1972). 4 tab, 7 ref.

Descriptors: *Economic efficiency, *Legislation, *Environment, *Livestock, Pollution abatement, Permits, Control, Confinement pens, Farm wastes.
Identifiers: *Waste management, Administrative codes, Legislative proposals, Registration criteria.

A 1971 survey of water quality statutes in 27 major beef-producing states revealed a mixture of general statutes, specific registry statutes, administrative codes, approval procedures, and permit systems applicable to livestock producers. Tables show percentages of beef produced in the states surveyed, the forms of state water pollution statutes applicable to livestock waste management, criteria for requiring registration of livestock and poultry production firms, and criteria for requiring registration or permits provided by general state water quality statutes. Implications of these statutes for both beef producers and society were broadly discussed. (See also W74-09663) (Lynch-East Central)
W74-09670

POTENTIAL CITIZEN INITIATED LEGAL ACTION AGAINST AGRICULTURAL POLLUTION,
West Virginia Univ., Morgantown. Div. of Resource Management.
D. Colyer, and D. R. Levi.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 83-95 (1972). 37 ref.

Descriptors: *Regulation, *Legal aspects, *Control, *Pollution abatement, *Common law, Discharge, Farm wastes.
Identifiers: Citizen initiated legal action, *Agricultural pollution, Mandamus, Class action, Constitutional provisions, Public trust doctrine.

Feasible individual or group action against pollution is outlined. Citizens may seek a judicial decree constraining administrators to perform environmentally-related duties, usually through mandamus, or bring direct suit against a polluter. Plaintiffs may sue polluters under nuisance laws, illustrating intentional and unpriviledged entry onto land, or under trespass laws, requesting an injunction, damages or both. They may also utilize class or declaratory judgement actions. The Refuse Act of 1899, the National Environmental Policy Act of 1969, and the ninth amendment to the Constitution have also guaranteed the rights of the individual to a clean environment. (See also W74-09663) (Lynch-East Central)
W74-09671

DAIRY FARMER CONCERNS OF LAWS AND REGULATIONS AFFECTING ANIMAL WASTE MANAGEMENT,
National Milk Producers Federation, Washington, D.C.
J. B. Adams.
In: Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Ithaca, New York, p 97-100 (1972).

Descriptors: *Dairy industry, *Farm wastes, *Regulation, *Legislation, *Water pollution, Waste disposal, Permits.
Identifiers: *Waste management, *National Milk Producers Federation.

The National Milk Producers Federation has adopted an environmental issues policy which recognizes the need for reasonable balance between animal agriculture, costs to consumers, and future environmental quality. Dairymen face a problem in complying with conflicting federal regulations. According to the U.S. Public Health Service, in order to maintain a license to produce Grade 'A' milk, a dairy must regularly remove and deposit manure on the land. On the other hand, most water pollution regulations require a retention of the manure or other means of preventing animal wastes' entrance into public waters. Obviously, dairymen can't comply with both regulations at the same time. Many regulations also require a permit to discharge animal wastes into navigable waterways. This across the board approach fails to accommodate the flexibility required to enable producers to employ practical solutions to individual problems. (See also W74-09663) (Marquard-East Central)
W74-09672

AMERICAN COCKROACH FEEDING IN SEWER ACCESS SHAFTS ON PARAFFIN BAITS CONTAINING PROPOXUR OR KEPONE PLUS A MOLD INHIBITOR,
North Carolina State Univ., Raleigh.
C. G. Wright, H. C. McDaniel, H. E. Johnson, and C. E. Smith.
Journal of Economic Entomology, Vol 66, No 6, p 1277-1278, December, 1973. 1 tab, 2 ref.

Descriptors: *Sewers, Eradication(Pests), *Insect control, Attractants, Insects, *Pesticides, *Insecticides.
Identifiers: *Cockroach, Periplaneta americana, *Kepone, *Proxopur.

The control of the American Cockroach, Periplaneta americana, in sewer access shafts was investigated. Baits containing 0.125% Kepone (decachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd)pentalene-2-one) or 2 percent propoxur, with or without p-nitrophenol mold inhibitor, and embedded into paraffin cakes were placed in the infested shafts. Cockroaches did not feed on propoxur baits. Feeding occurred on some Kepone baits with and without mold inhibitor, but not after mold became visible. Addition of the mold inhibitor reduced the molding of propoxur and Kepone baits. There was a reduction in cockroach numbers in baited sewer access shafts; however, dead cockroaches were observed only in shafts containing Kepone baits with visible feeding signs. Cockroach numbers increased in shafts with paraffin check cakes. Baits in moist shafts increased in weight by absorbing ambient moisture, and disintegrated in humid shafts with high ambient temperatures. (Merritt-FIRL)
W74-09717

HYDRAULICS OF A WATER SUPPLY SYSTEM WITH FLUCTUATING WATER DEMAND, (HYDRAULIK EINES WASSERVERSORGUNGSSYSTEMS MIT FLUKTUIERENDEN BEDARFSMENGEN),
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 8B.
W74-09726

INSTALLATION OF LARGE-DIAMETER FIBER-GLASS FLEXIBLE PIPE IN MUNICIPAL SYSTEMS,
Johns-Manville Corp., Denver, Colo.
For primary bibliographic entry see Field 8A.
W74-09727

ENGINEERING AND CONSTRUCTION PRACTICES FOR GRAY AND DUCTILE CAST-IRON PIPE,
Cast Iron Pipe Research Association, Oak Brook, Ill.
For primary bibliographic entry see Field 8B.
W74-09728

WATER POLLUTION PREVENTION IN SOUTH WALES,
Wales Directorate of Engineering (England).
H. Cronshaw.
Water Pollution Control, Vol 78, No 1, p 41-50, 1974. 4 fig, 2 tab.

Descriptors: *Water pollution control, *Waste water disposal, *Discharge(Water), Regulation, Watersheds(Basins).
Identifiers: *Wales(Seven Estuary-Bristol Channel).

Water pollution prevention in South Wales is particularly relevant in that the catchment area draining to the Severn Estuary and Bristol Channel contains almost two-thirds of the population of the

Principality and all its major industries. Rapid progress is being made to clean up the rivers of South Wales and there is a much greater awareness of the need for caution in discharging waste water. Pollution prevention measures have taken place within a general policy framework which is sufficiently flexible to meet future demands. (Sandoski-FIRL)
W74-09735

COST OF ACHIEVING E.P.A.'S BPCTCA AND ZERO DISCHARGE.
Paper Trade Journal, Vol 158, No 15, p 30-35, April 15, 1974. 3 fig, 6 tab.

Descriptors: *Economic impact, *Federal Water Pollution Control Act, *Pulp and paper industry, Water quality, Effluents, Operating costs, Capital costs, Mills, Energy.
Identifiers: *Amendments.

Highlights from an engineering estimate study of the cost of meeting selected Environmental Protection Agency national effluent limitation levels are presented. Operating costs for achieving zero pollutant discharge were estimated at $1.7 billion annually. An additional capital investment of $1 billion by the pulp and paper industry will be required to supplement its existing external effluent treatment facility to meet the proposed best practicable control regulations scheduled for 1977. The investment and operating costs for those mills on municipal sewage treatment and those costs associated with compliance to best practical control technology currently available (BPCTCA) are in addition to those estimates. The energy requirement is the single largest cost component of the total operating cost for zero discharge treatment for the pulp and paper industry. (Merritt-FIRL)
W74-09748

U.S. COAST GUARD OIL POLLUTION INVESTIGATION AND CONTROL SCHOOL.
Coast Guard, Yorktown, Va.
Available from NTIS, Springfield, Va 22151 as AD-758 511, Price $6.75 printed copy; $1.45 microfiche. Coast Guard RTC On-Scene Coordinator's Manual, November 1972. 278 p.

Descriptors: *Oil spills, *Water pollution treatment, *Federal government, Water pollution control, Oil pollution, Federal water pollution control act, Planning, Navigable waters.

This National Oil and Hazardous Substances Pollution Contingency Plan has been developed in compliance with the Federal Water Pollution Control Act. The plan provides for a pattern of coordinated and integrated response by Departments and Agencies of the Federal Government to protect the environment from the damaging effects of pollution spills. It also promotes the coordination and direction of Federal, State, and local response systems and encourages the development of local government and private capabilities to handle such pollution spills. The objectives of this plan are to provide for efficient, coordinated and effective action to minimize damage from oil and hazardous substance discharges, including containment, dispersal, and removal. The plan, including the annexes and regional plans, provides for: (a) assignment of duties and responsibilities, (b) establishment and identification of strike forces and emergency task forces, (c) a system of notification, surveillance and reporting, (d) establishment of a National Center to coordinate and direct operations in carrying out this plan, (e) a schedule of dispersants and other chemicals to treat oil spills, (f) enforcement and investigative procedures to be followed, (g) directions on public information releases and 9h) instructions covering on-scene coordination. (Knapp-USGS)
W74-09753

SALINITY CONTROL INTERIM REPORT FOR WATER SUPPLY AND WATER QUALITY CONTROL STUDY, BRAZOS RIVER BASIN, TEXAS.
Environmental Protection Agency, Dallas, Tex.
Available from NTIS, Springfield, Va 22151 as PB-227 057, Price $12.00 printed copy, $1.45 microfiche. Environmental Protection Agency Region VI Report, March 1973. 144 p, 20 fig, 19 tab, 20 ref, 3 append.

Descriptors: *Saline water, *Water pollution control, Rivers, *Texas, Brines, Springs, Water quality, Water chemistry, Chlorides, Sulfates, *Water supply, Potable water.
Identifiers: *Brazos River(Texas), *Salinity control.

The quantity of salts collected and transported by the Brazos River, Texas, can be substantially reduced by construction of control projects proposed by the Corps of Engineers. Construction of salinity control project will reduce mineral concentrations sufficiently to allow use of water resources in the entire stretch of the main stem in and below Possum Kingdom Reservoir for potable water supplies. (Knapp-USGS)
W74-09755

STATE STANDARDS FOR MERCURY AND HEAVY METALS.
Environment Reporter, 1973, p 41-50. State Water Laws, Sec 621: 0401-0410, 1 tab.

Descriptors: *Mercury, *Heavy metals, *Water quality standards, *Standards, Control, Regulation, Toxins, Waste water treatment.

This digest was compiled in order to provide general information to the public as well as to Federal, State and local officials. It contains excerpts from the individual Federal-State water quality standards establishing mercury and heavy metals criteria for interstate waters. Standards, the first nationwide strategy for water quality management, contain four major elements: (1) the use to be made of the interstate water, (2) criteria to protect those uses, (3) implementation and enforcement plans, and (4) an antidegradation statement to protect existing high quality waters. Mercury, silver, arsenic, cadmium, chromium, copper, lead, nickel, and zinc are heavy metals in waters which present serious pollution problems because they have persistent and toxic effects for many years following deposit. Marine organisms, especially shellfish, readily take up and concentrate these heavy metals, which are thereafter ingested by man. Individual state-adopted criteria are listed. Twenty-five states have no specific criteria. (Jernigan-Vanderbilt)
W74-09767

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

DECISION ANALYSIS ON WATER RESOURCES PLANNING AND MANAGEMENT FOR AN ARID METROPOLITAN CENTER IN WEST TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
J. H. Dean, and C. S. Shih.
Available from the National Technical Information Service as PB-233 377, $4.75 in paper copy, $1.45 in microfiche. Technical Report No. 54, October 1973. 142 p, 17 fig, 38 ref. OWRR B-102-TEX(1). 14-31-0001-3652.

Descriptors: *Risks, *Decision making, Probability, Cities, Water resource development, Evaluation, *Texas, Alternative planning, Water management(Applied), Arid lands.
Identifiers: Delphi method, *Probability assessment, *Utility assessment, Urban water resources development, *San Angelo(Tex), *Bayesian decision analysis, Sensitivity analysis.

Bayesian decision theory provides a procedure for the use of subjective data in decision-making situations related to urban water resource development. The procedure is effectual in pursuing a set of goals and transforming individual group indecisiveness into satisfactory decisions. The approach is highlighted due to its capability to incorporate seemingly unquantifiable, abstract factors into the decision-making process. It is realized that the soliciting of expert and general public opinion is indispensible in making choices for the welfare of the general public from alternative courses of action under uncertainties. The analysis presented considers engineering alternatives, quality, quantity, cost, and the intangible public response in an integrated effort for the selection of optimum strategies in urban water resource development.
W74-09364

FUNCTIONS TO PREDICT OPTIMAL IRRIGATION PROGRAMS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3F.
W74-09476

ANALYTICAL MODEL FOR MANAGEMENT OF ALLUVIAL AQUIFERS,
Colorado Dept. of Natural Resources, Denver. Div. of Water Resources, Planning and Investigations.
For primary bibliographic entry see Field 4B.
W74-09477

USE OF DECISION THEORY IN RESERVOIR OPERATION,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-09478

CONTINUOUS SIMULATION MODELS IN URBAN HYDROLOGY,
Organization Stanford Univ., Calif.
For primary bibliographic entry see Field 3D.
W74-09479

A TEST OF ALTERNATIVE MODELS FOR PROJECTING COUNTY INDUSTRIAL PRODUCTION AT THE 2, 3, AND 4-DIGIT STANDARD INDUSTRIAL CODE LEVELS,
Livingston Coll., New Brunswick, N.J.
For primary bibliographic entry see Field 3E.
W74-09551

THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS,
Texas Water Development Board, Austin. Coastal Zone Studies Branch and Systems Engineering Div.
For primary bibliographic entry see Field 2L.
W74-09556

SIMULATION CRITERIA FOR SELECTING WATER RESOURCE SYSTEM ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
G. J. Vicens, and J. C. Schaake, Jr.
Report No 54, September 1972. 133 p, 17 fig, 18 tab, 45 ref.

Descriptors: *Systems analysis, *Decision making, *Analytical techniques, *Mathematical

models, *Planning, Benefits, River basin development, Design, Correlation analysis, Computer programs.
Identifiers: *Simulation models, Multiobjective planning, Rio Colorado(Argentina).

The application of experimental design principles to water resource simulation is examined. The research explores the role of simulation in planning, the experimental nature of simulation, criteria to make sampling decisions about the appropriate length of simulation experiments, and a basis to evaluate decisions based on simulation experiments. The role of simulation in planning is described. The concept of designing simulation experiments and an application of the techniques developed as applied to Rio Colorado, Argentina, are explored. Of the two procedures described, the first allows pair-wise comparisons of the alternatives. The effects of serial and cross-correlation samples are explored the former increasing the required number of observations while the latter reduces the length of required runs. The second procedure allows comparison of more than two alternatives but does not consider correlated samples. Utilizing the above procedures, the experimentor can assess the reliability of information which he provides. For any set of weights on the objective the reliability of selecting any alternative as optimal can be evaluated. Additionally, the number of additional observations required to improve reliability can be specified. A computer program and a user manual for the Rio Colorado study are given. (Schroeder-Wisconsin)
W74-09567

A GENERAL PURPOSE SIMULATION MODEL FOR ANALYSIS OF SURFACE WATER ALLOCATION USING LARGE TIME INCREMENTS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
E. A. McBean, R. L. Lenton, G. J. Vicens, and J. C. Schaake, Jr.
Report No 160, November 1972. 245 p, 16 fig, 4 tab, 12 ref.

Descriptors: *Rivers, *Mathematical models, *Decision making, *Comprehensive planning, *Water allocation(Policy), Scheduling, River basin development, Algorithms, Computer programs, Analytical techniques.
Identifiers: Multiple objective planning, *Argentina(Rio Colorado).

The computer program, HISIM (High-spped Simulation) is designed to provide a versatile approach to river basin planning through the tracing of the real time behavior of a river system when affected by a variety of external conditions. The discrete time intervals utilized are of the order of several months. This report is essentially a user's manual for the simulation model, providing the formulation of the various algorithms, definition of the model's structure, and description of the input data requirements. In order to provide the model with flexibility, the river system is pictured as a series of nodes connected between appropriate points by reaches or arcs. Nodes identified include dam points, diversion points, junction points, and irrigation points. Related to each of the nodes is one or more algorithm which specifies how the component works. The general form of the mathematical program associated with HISIM maximizes the sum of the net weighted regional and national benefits. To evaluate the objective functions, HISIM contains two accounting schemes to assess national and regional benefits. An application of HISIM to the Rio Colorado, Argentina is documented and discussed. (Schroeder-Wisconsin)
W74-09568

COMPUTER MODELING APPLICATIONS IN URBAN WATER PLANNING,
Denver Board of Water Commissioners, Colo.
N. Hobbs, and J. D. Britton.
Available from the National Technical Information Service as PB-233 673, $3.25 in paper copy, $1.45 in microfiche. American Society of Civil Engineers, Urban Water Resources Research Program Technical Memorandum No 22, New York, N.Y., March, 1974, 31 p, 2 tab, 11 fig, 3 ref. OWRR C-4048(No 9009)(5).

Descriptors: *Water supply, *Computer models, *Project planning, *Cities, Urbanization, *Reservoir storage, Diversion structures, Water conveyance, *Cost analysis, *Systems analysis, Hydrologic budget, Aquifer characteristics, Conjunctive use, Automatic control, Water reuse, Snowmelt, Prior appropriation, Water rights, Water transfer, *Colorado.
Identifiers: *Denver Water Department(Colo), Metropolitan studies, Modeling costs, Water distribution systems.

Few cases have been publicly documented where systems analysis techniques have been used in planning urban water supply systems. Indicated are applications made by a leading agency. Almost two-thirds of its metropolitan population is served by the Denver Water Department from a complex raw-water collection system that extends almost 150-miles to capture mountain snowmelt and involves transfers through the Continental Divide. Not detailed are plans for large-scale reuse and automatic control. Raw-water facilities-planning applications are emphasized. Descriptions, development histories, applications and costs incurred are presented for seven models: a collection system; a river-aquifer system; daily flow-routing; revenue-expenditure projection; a large-scale river basin; stream quality-quantity; and pumping power-requirements for a collection system. Some of the models could be used readily elsewhere. Computer requirements and model documentation status are described. Future raw-water facilities planning computer applications will include: runoff simulation and forecasting; a wastewater accounting system for reuse; a data-system development; urban growth pattern projection; and environmental analysis. Ultimately, raw and treated water simulation tools will be comprehensively integrated under a total system concept. (McPherson-ASCE)
W74-09654

MINIMIZING WATER AND SEWER SYSTEM COSTS USING TOPAZ,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Urban and Regional Studies.
J. W. Dickey, J. M. Anthony, D. R. Burton, A. R. Gordon, and K. R. Morgan.
Available from the National Technical Information Service as PB-233 690, $5.50 in paper copy, $1.45 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 67, March 1974. 194 p, 16 tab, 20 fig. OWRR A-050-VA(1).

Descriptors: *Land use, *Costs, Sewage, *Zoning, Water supply, *Virginia, *Optimization, Optimum development plans.
Identifiers: TOPAZ, Water system links, Sewage service, Cost Criterion, Blacksburg(Va.), Cost minimization, Cost models.

A mathematical technique known as TOPAZ (Technique for the Optimal Placement of Activities in Zones) has been applied to the Blacksburg, Virginia area, for which some data were already available, and an example was developed. Cost models for water and sewage service facilities were developed and employed in conjunction with other cost models (e.g., for travel, roads, and streets, buildings, and land values) to determine the least cost land use arrangement patterns. Additional studies were made of (1) proper criteria for use in TOPAZ, and (2) organization, legal, and financial mechanisms for implementing TOPAZ results. Findings indicate that (1) the minimum cost criterion appears most appropriate, (2) cost models are a definite need in TOPAZ, (3) resulting land use allocations are close to existing development, and (4) implementation mechanisms are very weak.
W74-09658

6B. Evaluation Process

COMMUNICATIONS FOR URBAN WATER RESOURCES MANAGEMENT--A REVIEW AND ANNOTATED BIBLIOGRAPHY,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
T. J. Cooke, and R. M. Males.
Available from the National Technical Information Service as PB-233 332, $4.00 in paper copy, $1.45 in microfiche. Completion Report, February 1974. 89 p, 1 fig, 122 ref. OWRR C-3196(no. 3700)(1).

Descriptors: *Water management(Applied), *Social participation, Behavior, *Bibliographies, Human resources, Reviews, Decision making, Cities, *Communication.
Identifiers: *Mass media, *Public involvement, *Citizen participation, Public relations, Small group techniques.

A literature review of the broadest aspects of 'communications theory' and practice is presented. The review is intended as a source-book for professionals interested in utilizing the findings of communications research in the design and conduct of public involvement programs for urban water resources programs. A basic presentation of the fundamental findings of communications theory, in the areas of basic communications processes, mass communications/persuasion, small group processes, and face to face communications is included. Literature surveyed is organized into theoretical, methodological, and applications areas, including sources for design of opinion sampling procedures, small group discussions, public hearings, etc. For most references included, pertinent quotes and citations are given to show the character and main thrust of the source document. (See also W74-09252)
W74-09251

DESIGN OF PROTOTYPE MASS MEDIA PROGRAMS FOR TESTING IN THE LOWER JAMES RIVER BASIN,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
R. M. Males.
Available from the National Technical Information Service as PB-233 433, $3.25 in paper copy, $1.45 in microfiche. Completion Report, February 1974. 25 p, 2 fig, 2 ref. OWRR C-31196(no. 3700)(2).

Descriptors: *Water management(Applied), Water quality, *Social participation, Behavior, *Virginia, Human resources, Decision making, *Communication.
Identifiers: *Mass media, *James River basin(Va.), Public involvement, Citizen participation, Public relations, Small group techniques.

Based upon a field survey, interviews, and literature review, the mass media program design for the public involvement and education aspects of a major water quality planning effort encompassing the Richmond and Norfolk areas of Virginia is presented. The design is considered to be a prototype design, which, with adaptation, can be useful in many areas and types of public involvement programs. A description of the philosophy and techniques of true public involvement is included, and the major features of the various types of mass media, and their utility in such programs, is discussed. Media included in the discussion/design are: presentations to small groups; 'sunday supplements;' TV documentary series; ongoing news coverage; public information booklet; public hearings; radio/TV talk shows; high school, college, and local news coverage; in school TV programming. The overall program design is charac-

terized in terms of goals, strategy, targets, media, timing, and organizational format. (See also W74-09251)
W74-09252

WASTE MANAGEMENT: GENERATION AND DISPOSAL OF SOLID, LIQUID AND GASEOUS WASTES IN THE NEW YORK REGION,
Regional Plan Association, N.Y.
For primary bibliographic entry see Field 5G.
W74-09353

ENVIRONMENTAL CONSIDERATIONS FOR WATER MANAGEMENT DISTRICT 6 OF COLLIER COUNTY,
Collier County Conservancy, Inc., Naples, Fla.
E. T. LaRoe.
Available from the National Technical Information Service as PB-233 483, $3.75 in paper copy, $1.45 in microfiche. Rookery Bay Land Use Studies, Study No. 8, Published by the Conservation Foundation, Washington, D.C., January 1974. 30 p, 7 fig, 15 ref. OWRR C-4022(No 9004)(4) C-1817(No 3170)(4) and C-2201(No 3385)(4).

Descriptors: *Florida, *Land use, *Optimum development plans, Coasts, Gulf of Mexico, Water utilization, Estuaries, *Water management(Applied), Planning, Water resources development, Natural resources, Conservation.
Identifiers: *Naples(Fla), *Rookery Bay(Fla).

A land and water use management program, designed to be consistent with and to complement existing state and local planning efforts, is proposed for a 64 square-mile coastal watershed around Rookery Bay Sanctuary near Naples, Florida. The program is intended to permit optimum development consistent with the protection and conservation of the natural resources. Existing values, resources and benefits of the natural system; physical restraints on potential development; and existing state and Federal wetlands guidelines are documented and considered. The program recommends a system of classifying lands as preservation, conservation (limited development) and development areas, based on natural features, resources, and constraints. Specific recommendations for developmental practices, as well as guidelines for implementation of the program, are included, as is a large-scale vegetation map suitable for use by planners.
W74-09360

DECISION ANALYSIS ON WATER RESOURCES PLANNING AND MANAGEMENT FOR AN ARID METROPOLITAN CENTER IN WEST TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 6A.
W74-09364

WATER SUPPLY EVALUATION AND PROPOSED COMPREHENSIVE STUDY OF THE CHARLESTON-BUSHY PARK INDUSTRIAL COMPLEX, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 2L.
W74-09389

CANOEIST SUGGESTIONS FOR STREAM MANAGEMENT IN THE MANISTEE NATIONAL FOREST OF MICHIGAN,
Huron-Manistee National Forest, Cadillac, Mich.
M. J. Solomon, and E. A. Hansen.
Research Paper NC-77, 1972. 10 p, 4 fig, 2 tab, 3 ref.

Descriptors: *Boating, *Rivers, *Michigan, *Recreation, *Aesthetics facilities, *Attitudes, Erosion, Dams, Erosion control, Chennel improvement, Use rates.
Identifiers: *Manistee National Forest(Mich).

A survey was undertaken to determine canoeists' opinions concerning their experiences on the Pine River, Michigan. Canoeists' attitudes toward eroding streambanks should play a large role in deciding whether or not to stabilize the banks. About 50,000 persons canoed the Pine River during 1971. Most canoeists enjoyed their trip, particularly the rapids and the wild, natural appearance of the stream and its shoreline. The primary objections concerned littering and crowding. Comments that involve stream management can be summarized as 'leave the stream natural with little or no development' and 'clean up the litter.' Canoeists were unconcerned about eroding streambanks and about a dam they had to portage around. (Knapp-USGS)
W74-09404

ENVIRONMENT: A NEW FOCUS FOR LAND-USE PLANNING.
National Science Foundation, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09412

ECONOMIC POLICIES, ENVIRONMENTAL PROBLEMS, AND LAND USE,
California Univ., Riverside.
R. C. d'Arge.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 157-182, October, 1973. 2 fig, 30 ref.

Descriptors: *Economics, *Economic efficiency, *Land use, *Environmental control, *Decision making, Use rates, Social values, Evaluation, Local governments, State governments, Equitable apportionment, Texas, Administration, Planning.
Identifiers: Control agency structure, Information costs.

A wide range of developments in economic theory present a number of options in the resolution of land use problems. These developments are in areas such as information costs, improvements on the Pareto efficiency concept, charge and subsidy systems, coercive exchange processes, irreversibility, and input-output systems. In order to employ these theoretical tools, a toxonomic division is made of the environmental/land use problem into 3 areas: (1) actors and action systems, (2) social indicators and evaluative system and (3) goals and the social welfare system. Using these divisions a need is seen for a prespecified set of goals and weights, a location and time specific set of social indicators, measurements of changes in social constraints, and a complete analysis of the relative efficiency of different environmental planning systems. In developing a control strategy, the degree of directness must be carefully chosen. A direct strategy such as zoning allows little or no latitude for private decision making and has high enforcement costs. A more indirect approach, e.g. user charges, has high information costs and more linkages between cause and effect. An optimum of directness (in terms of cost) exists somewhere between the two extremes. Criteria should be developed to compare the effectiveness of different control agencies, employing differing strategies. Such criteria should include efficiency in terms of cost, reliability of resolving issues, speed of operation, information costs, flexibility and degree of public understanding. (See also W74-09412) (LaPointe-North Carolina)
W74-09417

ECOLOGICAL CONCEPTS AND APPLICATIONS TO PLANNING,
Michigan State Univ., East Lansing. Dept. of Zoology.
W. E. Cooper, and R. D. Vlasin.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 183-215, October, 1973. 6 fig, 3 ref.

Descriptors: *Ecology, *Environment, *Ecosystem, *Planning, Constraints, Economic efficiency, Stability, Succession, Economies of scale, Waste treatment, Energy, Energy transfer, Institutions, Mass transfer, *Waste assimilative capacity.
Identifiers: Ecological irreversibility.

Certain ecological relationships can provide fundamental inputs to the planning process. Materials flow, waste matter and energy, waste assimilation and assimilation rates, production of a stable ecosystem, man's relationship to the natural ecological components of the earth's surface are some examples. In order to conceptualize the real world system it must be abstracted into a limited number of functional components: (1) transformations of matter and energy; (2) transport and storage of matter and energy; and (3) the control processes of feedback and selection. Any such conceptualization, however, requires an understanding of fundamental differences in two subsystems: human and natural. These subsystems vary in goals (growth versus survival), time domains (25 years versus many generations), spatial dimensions (highly aggregated versus highly dispersed) and stability. Other technical concepts suggested as direct use to planners are: (1) successional states, especially in computing the costs associated with maintenance of a simplified landscape; (2) natural constraints, to determine true productive and assimilative capacity of an ecosystem; and (3) processing capabilities, to prevent overloading. Determination of ecological potentials, waste treatment, the use of economies of scale, and the production of energy are all areas or practical application of ecological concepts. Particular emphasis should be placed on minimizing decisions that may result in irreversible environmental changes such as extinction, introduction of nondegradable chemicals, and depletion of concentrated resources. A serious difficulty exists in the marked dissimilarity between ecological space and policy space. (See als W74-09412) (LaPointe-North Carolina)
W74-09418

PLANNING FOR AREAS OF SIGNIFICANT ENVIRONMENTAL AND AMENITY VALUE,
California Univ., Berkeley. Dept. of Landscape Architecture.
R. H. Twiss.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 233-247, October 1973. 44 ref.

Descriptors: *Research priorities, *Planning, *Land use, *Land development, *Land management, Value, Regional development, Environmental effects, Economies of scale, Coordination, Estuaries, Urbanization, Legal review.
Identifiers: *Environmental impact statements, Amenity value, Functional planning, Research strategies.

The beneficial effects of critical areas radiating over large distances and advanced techniques in research, planning and implementation that have been developed in managing these areas are illustrative of their broader planning significance. A wide range of physical characteristics are of environmental signfificance, for example, physiographic features such as deep water access; key commodity resources; key renewable resources, e.g. a wildlife habitat or forest resources; natural processes, e.g. groundwater recharge areas; natural hazards like floodplains or geologic instability; and high pollution absorption levels. Site planning, regional planning and functional planning would all be concerned at some time with areas of significant environmental value although they would have varying objectives, options and information needs. Functional planning (i.e. planning for a specific use), has particular tools at its disposal such as legislative review, administrative budget review, internal agency review and coordination,

team planning, and functional area planning. The Environmental Impact Statement, a tool of special importance, can be critical to sensitive-area management as in the case of the Trans-Alaskan pipeline; however, impacts must be expanded to include the ecological chain of events that will follow given developments. General areas for proposed research are: key decision points in terms of jurisdiction and scale (i.e. global, national, state, local); increasing the efficiency of planning procedures and tasks already in common use; topics of practical value; and the economic costs of environmental policies and plans, plus matching research in specialized academic disciplines. (See also W74-09412) (LaPointe-North Carolina)
W74-09420

MANAGING WATER RESOURCES FROM THE WRONG PLACE AT THE WRONG TIME,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
C. A. McCullough.
Journal American Water Works Association, Vol 66, No 3, p 187-192, March 1974. 6 fig, 1 ref.

Descriptors: *Water management(Applied), *Water distribution(Applied), Groundwater management, Water demand, Watershed management, *Water supply development, *Planning, *Reservoir storage, Flood control, Desalination, Water quality control, *California.
Identifiers: California State Water Project, California Aqueduct.

California's economy is developed through use of summer flows of streams and drilling of wells in extensive groundwater basins. As these sources were overexploited, storage of winter flood flows and massive transportation facilities were constructed. Extensive water-quality control programs were implemented. The California State Water Project is described. New dimensions in water resource development are presented including desalting water, reclaiming and reusing water, weather modification, watershed management, and exploring the possibility of developing usable water from geothermal sources. Storage of water near urban areas is emphasized. (Campbell-NWWA)
W74-09528

BEYOND 'CITY WATER': RURAL WATER SYSTEM DESIGN,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
J. E. Foster.
Water Well Journal, Vol 28, No 2, p 26, 53-55, February 1974.

Descriptors: *Wells, Community development, *Water supply, *Design, Rural areas, Economics, Flow rates, Conduits, Construction costs, Operating costs.
Identifiers: *Rural water supply.

The factors to be considered in the development of an economical, safe, and dependable rural water supply are discussed. In designing rural water facilities it is suggested that greater emphasis be placed on such factors as simplicity, flexibility, low initial construction cost, ease of operation, ease of maintenance, and low cost of operation. The point is made that the design of rural water systems should not follow the plans of the more elaborate and sophisticated urban facilities. (Campbell-NWWA)
W74-09538

ACCELERATED GROWTH IN AGRICULTURAL PRODUCTION AND THE INTERSECTORAL TRANSFER OF RESOURCES,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W74-09550

CHURCHILL FALLS--THE COSTS AND BENEFITS OF A HYDRO-ELECTRIC DEVELOPMENT PROJECT,
Macquarie Univ., North Ryde (Australia).
P. Crabb.
Geography, Vol 58, No 261, Part 4, p 330-335, 1973. 2 fig.

Descriptors: *Hydroelectric plants, *Cost-benefit analysis, *Project post-evaluation, Subarctic, Environmental effects, Economic impact, Underground powerplants, *Canada, Hydroelectric power, Reservoirs.
Identifiers: *Labrador(Canada), Churchill Falls(Labrador).

In June 1972 the Churchill Falls hydroelectric project was operationalized, five months ahead of schedule. The $1073 million, 5225 mW project is located within the southern Labrador wilderness and is the largest single H.E.P. station in the Western World. The main storage body, Smallwood Reservoir, was formed by 64 km of earth and rock-fill dykes and represents the third largest man-made lake in the world. Water levels are regulated by seven remote control structures with heated gate-guides to prevent ice formation. The construction of the vast project in such a remote location created problems of transmission which had to be overcome. The Churchill Falls scheme provides significant power to Quebec as well as to Ontario, New Brunswick, Maine, and New York State. The project has not boosted the development of Newfoundland and Labrador, apart from one short term construction income. Additionally the project made major ecological changes to the Lower Churchill River and southern Labrador which have not fully been assessed. (Schroeder-Wisconsin)
W74-09562

ENVIRONMENTAL DISRUPTION: IMPLICATIONS FOR ECONOMIC PLANNING,
U. E. Simonis.
Developing Economies, Vol 10, No 1, p 86-105, 1972. 41 ref.

Descriptors: *Gross National Product, *Welfare(Economics), *Planning, *Environmental effects, Regional economics, Social values, Decision making, Community development.
Identifiers: *Gross National Welfare Index.

Improved environmental planning and changing concepts of regional and national development have led to increasing demands for a revision of the GNP accounting process. A review of the existing practices reveals rising GNP with declines in welfare, a worsening infrastructure, increased agglomeration of population and industry, and greater risk of environmental disruption. A number of alternatives to GNP accounting practices which alleviate these problems are reviewed. In the first, 'net national welfare,' both 'bads' and 'goods' are calculated to allow the integration of environmental factors into economic and political decisions. 'Bads' discussed include institutionalization of wastes, depletion of resources, and inefficiency of the dynamic adjustment processes. Other alternative accounting methods proposed examine declines in stock variables rather than the flow-variables approach in traditional GNP practices and a measure which evaluates changes in levels of qualitative social indicators representing scales of obtainment of basic social needs. Included in the former variables are natural stock--water; public stock--housing and transportation; and personal stock--teachers and doctors. Social indicators face an essential difficulty in determining weights for aggregation. Unlike GNP, each of the alternative accounting approaches does not emphasize growth concentrating on the improvement of welfare instead. (Schroeder-Wisconsin)
W74-09564

GROUNDWATER QUALITY. DOOR COUNTY, WISCONSIN.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-09565

SIMULATION CRITERIA FOR SELECTING WATER RESOURCE SYSTEM ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 6A.
W74-09567

A GENERAL PURPOSE SIMULATION MODEL FOR ANALYSIS OF SURFACE WATER ALLOCATION USING LARGE TIME INCREMENTS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 6A.
W74-09568

ECONOMIC DEVELOPMENT STUDY OF THE TEXAS COASTAL ZONE,
Texas A and M Univ., College Station. Industrial Economics Research Div.
G. R. Rapp, D. M. French, and J. Miloy.
Available from the National Technical Information Service as COM-73-1041, $3.00 in paper copy, $1.45 in microfiche. Sea Grant Program TAMU-SG-72-212, June 1972. 140 p, 24 fig, 29 tab, 29 ref. NOAA 2-35213.

Descriptors: *Economic prediction, *Baseline studies, *Texas, *Coastal plains, Economics, Human population, Natural resources, Industries, Employment, Income, Rural areas, Urbanization, Land use, Recreation, Tourism, Navigation, Water resources, Regional development, Forecasting.
Identifiers: *Texas coastal zone, Deepwater ports, Supertankers, Nuplex.

Baseline data for the years 1940-1970 on economics, natural resources and demographics is compiled and analyzed, and future assumptions and economic projections generated to the year 2020. In the examination of economic growth are population growth, industrial growth by sector, employment trends and income trends for the Texas Coastal Zone. Current conditions of renewable and nonrenewable resources are explored. In the first category, agricultural and commercial fishing resources are discussed; for the latter, existing quantities, quantities consumed, and resource valuation are presented for mineral fuels, cement, stone, sulphur, salt, sand and gravel. lime, clay and gypsum. Urban and rural changes are delineated and demographic trends, income trends, industrial earnings by sector, and land use are examined primarily for the 1940-70 period. Further assumptions are explored and projections made for future population, industries, income, recreation and tourism, and employment levels within the zone. The ratio correlation method, the standard linear regression model assuming constant slope, and least squares were used to project population, production and economic values, and employment, respectively. The feasibility of a Nuplex, a large agglomeration of agricultural and industrial facilities combined with the necessary supporting population and producing and fabricating products, to be located in this area is described. (Schroeder-Wisconsin)
W74-09569

SNOW LOAD ANALYSIS AND RECREATIONAL USES OF SNOW DATA,
For primary bibliographic entry see Field 2C.
W74-09610

ASSESSING VISUAL-CULTURAL VALUES OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture.
R. C. Smardon.
Available from the National Technical Information Service as PB-233 687, $18.50 in paper copy, $1.45 in microfiche. Thesis, October 1972. 308 p, 2 fig, 35 tab, 32 plates, 6 append, 297 ref. OWRR B-012-MASS(2), OWRR B-023-MASS(2).

Descriptors: *Wetlands, *Aesthetics, *Social values, *Evaluation, *Decision making, *Massachusetts, Land use, Classification, Legislation, Value engineering, Cost-benefit analysis, Model studies.
Identifiers: Inland wetlands.

The incorporation of the visual-cultural values of inland wetlands into governmental land-use decisions is explored for Massachusetts. Previous studies which have sought to identify, analyze, and classify workable inland wetland types and surrounding landscape types are reviewed and a general form is suggested for Massachusetts wetlands. Visual-cultural values include the visual, recreational, and educational values of the wetlands to society. An inland wetland decision model, utilizing previously collected data, is developed to determine priorities for wetland preservation. The model is eliminative, in that it eliminates a wetland from development if it receives top priority in any of three evaluation levels. At level 1, are wetlands identified as outstanding natural areas, having high regional value or playing an important part in the overall wetland system which are rated top priority. If not eliminated at this stage, the wetland is next rated and ranked by its physical dimension and characteristics, utilizing 10 natural resource variables. A composite score composed of a weighted sum of the ten variables is developed to rank each wetland. The third level of evaluation considers the cultural values, i.e., accessibility, location near schools, etc., of the wetlands. The versatility of this approach to many decision levels is discussed. (Schroeder-Wisconsin)
W74-09651

WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN MINNESOTA, 1974 - GUIDELINES FOR RESEARCH PROGRAMS,
Minnesota Univ., St. Paul. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service as PB-233 689, $4.75 in paper copy, $1.45 in microfiche. Bulletin 68, June 1974. 127 p, 26 ref. OWRR A-028-MINN(10).

Descriptors: *Water resources, *Planning, *Minnesota, *Research priorities, Research and development, *Conferences, Water resources, Institute, State governments, Government finance.
Identifiers: *Research needs.

Eight water resources problem-research need analysis conferences were held during 1973 to determine research needs and to set research need priorities. A committee reviewed institutional arrangements for coordinating water resources research efforts in Minnesota and recommended that the Water Resources Research Center expand its Advisory Committee to include additional members from State Colleges and Branches of the University of Minnesota. A statewide priority list of 230 needed research projects was generated and research costs ($9 million) and manpower (500 man-years) needs were estimated. According to future projections based on past trends, total expenditures for water resources research conducted in Minnesota could increase from about $3.9 million in 1972 to about $8 million in the year 2020. Projections of expenditures, can only be classified as modest. About 67 percent of water resources research proposals submitted by faculty of the University of Minnesota and State and Private Colleges in 1972 was funded. There is a need for about $700,000 of additional annual financial support. This need could be met within a reasonable period of time if Congress were to appropriate and the President were to release additional funds consistent with its full authorizations associated with the amended Federal Water Resources Research Act and the Federal Water Pollution Control Act amendments of 1972, and the State Legislature, through the Minnesota Resources Commission, were to increase its annual financial support for water resources research by at least $100,000.
W74-09656

WATER RESOURCE PROBLEMS AND RESEARCH NEEDS OF NORTH CAROLINA - A REASSESSMENT,
North Carolina Water Resources Research Inst., Raleigh.
D. H. Howells.
Available from the National Technical Information Service as PB-233 699, $4.00 in paper copy, $1.45 in microfiche. Report No 2 (Revised), June 1, 1974, 70 p, 35 ref. OWRR A-999-NC(40). 14-31-0001-4033.

Descriptors: *North Carolina, *Research priorities, *Planning, *Research and Development, *Management, Water pollution control, Land use, State governments, Legislation.

A summary is presented of North Carolina's water resource problems and research needs, prepared as a source of orientation for the NC Water Resources Research Institute's research program. The subject matter is presented within the broad categories of water resource planning, water pollution control, and water quantity management. The problems and needs discussed represent those areas in which the Institute is attempting to encourage a research response from potential investigators. Current and needed studies and research referred to reflect the collective statewide effort of public agencies, industry, and the university community. Twenty-three priority research needs are separately listed. Three appendices are devoted to 'Declaration of Public Policy and Goals for Water Related Land Resources,' 'New State Legislation and Utility Commission Rules,' and 'Basic Data Systems'. (McJunkin-North Carolina State)
W74-09657

ALTERNATIVE SOLUTIONS TO WATER RESOURCE DEVELOPMENT--A CASE STUDY,
Texas A and M Univ., College Staztion. Water Resources Inst.
R. David Basco, and K. M. A. Rahman.
Available from the National Technical Information Service as PB-233 725, $5.50 in paper copy, $1.45 in microfiche. Office of Water Resources Research Technical Report No 55, May 1974. 175 p, 31 fig, 35 tab, 100 ref, 8 append. OWRR B-141-TEX(1). 14-31-0001-3938.

Descriptors: Planning, *Alternative planning, Comprehensive planning, *Project planning, *Texas, Alternative water use, *Water resources development, Feasibility studies, *Methodology, *Cost comparisons, Multiple purpose projects, Reservoirs.
Identifiers: *Brazos River basin(Tex), *Millican reservoir(Tex).

An effort was made to develop procedural methodology for the consideration of alternative solutions for water resources development in a short period of time with a view toward reduction of total costs involved in prefeasibility studies. Three techniques were developed to estimate the investment costs of a reservoir project, a levee project, and a basin conservation reservoir project in an economic region. The application of the methodologies were illustrated by a case study. The cost of a reservoir project in the case study area determined by the method developed was in excellent agreement with the Corps of Engineers' estimate using conventional methods. Selected solutions for water resources development problems in the Navasota River watershed were analyzed. The cost of water supply by desalination in the service area of the proposed Millican reservoir was computed following the procedure recommended by the Office of Saline Water. The investment costs of the alternatives were compared. The multipurpose reservoir project for flood control, water supply and recreation was found to be the least costly project. However, levees for flood protection in the lower Brazos River basin and desalting for water supply appeared to possess more intangible environmental benefits although the estimated cost of this multipurpose alternative was somewhat higher in comparison to the multipurpose reservoir project. Evaluation of intangible cost factors (environmental, aesthetic, etc.) was not possible in want of scientifically amenable procedures. Total costs (combined tangible and intangible factors) of all alternative plans could not be estimated.
W74-09661

WASTEWATER RECLAMATION: SOCIO-ECONOMICS, TECHNOLOGY, AND PUBLIC ACCEPTANCE.
Ralph Stone and Company, Inc., Los Angeles, California.
For primary bibliographic entry see Field 5D.
W74-09662

MANAGING WATER RESOURCES: BASIC CONSIDERATIONS AND PROBLEMS,
San Francisco Water Dept., Calif.
H. C. Medbery.
Journal of the American Water Works Association, Vol 66, No 3, p 173-175, March, 1974. 8 ref.

Descriptors: *Water management(Applied), *Administration, Water resources, *Water resources development, Public rights, Management, *United States.

The United States has ample water resources for present and near-future needs provided there is proper management. A standard plan for all water resources management cannot be provided since each area has specific problems. Thus the selection of a new or additional water source is dependent upon local conditions and public involvement. Growth patterns, local requirements, and special-interest groups will need balancing and adjusting if proper management is to be attained. (Sandoski-FIRL)
W74-09734

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

HURRICANE AGNES-DAMAGE IN PENNSYLVANIA,
Pennsylvania State Dept. of Transportation, Harrisburg.
For primary bibliographic entry see Field 2E.
W74-09393

FLOOD DAMAGE IN SOUTH DAKOTA,
South Dakota State Dept. of Highways, Pierre.
For primary bibliographic entry see Field 2E.
W74-09394

ECONOMICS OF ALTERNATIVE WASTEWATER TREATMENT SYSTEMS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-09427

IRRIGATION COST FOR LAND DISPOSAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-09428

COSTS AND RETURNS OF LAND SPREADING WASTWATER,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W74-09429

COMPUTER DATA FLOWS SMOOTHLY FOR SMALL WATER AUTHORITY,
Monroeville Water Authority, Pa.
F. H. Kingsley.
Public Works, Vol 105, No 1, p 52-53, January, 1974.

Descriptors: *Treatment facilities, *Computer programs, *Data processing, *Budgeting, Planning, Consumptive use, *Pennsylvania, Municipal wastes.
Identifiers: Billing, *Monroeville(Penn).

The computerized data processing procedures at the Monroeville, Pennsylvania, Water Authority Plant are described. The plant has 7,548 customers who use an average of 2.7 million gallons water a day. An IBM System/3 Model 6 computer processes all water billing accounting work including payroll and general ledger, as well as arranging management reports. The computer provides vital water consumption analyses for rate structure purposes and allows billing on a monthly, quarterly, or regular budget basis. Other services and reports include: trial balance reports giving a complete status of the business within one hour; water bills processed at the rate of eight per minute; sheets for the reader's meter book processed at the rate of 40 a minute; an alphabetic listing of customers in two and a half hours; a tenant listing in rental properties; and a monthly past-due listing. (Merritt-FIRL)
W74-09483

PIONEERING PLANT PROVIDES COST-SAVING ALTERNATIVE TO SEPARATING SEWERS.
For primary bibliographic entry see Field 5D.
W74-09490

RESTORATION OF WASTEWATER FACILITIES DAMAGED BY TROPICAL STORM AGNES,
Environmental Protection Agency, Washington, D.C. Emergency Operations and Planning Div.
For primary bibliographic entry see Field 5D.
W74-09496

ECONOMIC IMPACT OF FWPCA WATER EFFLUENT STANDARDS AND GOALS.
For primary bibliographic entry see Field 5D.
W74-09497

O AND M COSTS: PAY NOW OR PAY LATER,
National Water Well Association, Houston, Tex. Research Facility.
For primary bibliographic entry see Field 4B.
W74-09533

SUPPLY-ECONOMIC RELATIONSHIPS OF OFFSHORE PETROLEUM OPERATIONS,
National Petroleum Council, Washington, D.C.
For primary bibliographic entry see Field 3E.
W74-09552

EFFECT OF WATER METERING IN USA.
Water and Water Engineering, Vol 77, No 932, p 379-380, 1973.

Descriptors: *Water utilization, *Measurement, *Pricing, *Instrumentation, Lawns, Domestic water, Industries, Elasticity of demand, Water rates, Use rates, United States.
Identifiers: *United Kingdom.

Long term water usage trends and the impact of metering on United States' consumption were surveyed in a Water Use Committee report, an American Water Works Association study group; the report's implications for the United Kingdom water use trends are discussed. While U.S. residential per customer usage increased by 1% in 1960-70, actual per capita increase may be less, the per customer increase reflecting an increased number of multifamily units found on a single account. Population movements, changes in housing styles, increased industrial water use efficiency, and greater customer cost consciousness have affected long term water usage trends. Several examples of higher costs illustrate the impact of water metering on consumption. In one study of 23 undertakings, an increase to 60-70 cents from 20-30 cents per 1000 U.S. gallons decreased consumption 30%. Overall consumption decisions following prices increase, it is contended, depend upon the level of water usage and the severity of the increase, with consumption declines often only temporary. A comparison of U.S. and U.K. rates and usage indicates that the introduction of metering and resultant higher prices will have little impact on the U.K. consumption until sizeable per capita consumption increases. (Schroeder-Wisconsin)
W74-09553

CAPITAL BUDGETING FOR POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W74-09558

EFFLUENT CHARGES: A CRITIQUE,
Pennsylvania Univ., Philadelphia. Wharton School.
For primary bibliographic entry see Field 5G.
W74-09560

CONTROLLING POLLUTION BY PRICE AND STANDARD SYSTEMS: A GENERAL EQUILIBRIUM ANALYSIS,
Williams Coll., Williamstown, Mass.
For primary bibliographic entry see Field 5G.
W74-09561

POLLUTION CONTROL: NEW METHOD OF FINANCING,
Rothschild (L.F.) and Co., N.Y.
For primary bibliographic entry see Field 5G.
W74-09563

MINIMIZING WATER AND SEWER SYSTEM COSTS USING TOPAZ,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6A.
W74-09658

ECONOMIC IMPACT OF AGRICULTURAL POLLUTION CONTROL PROGRAMS,
Federal Reserve Bank of Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W74-09665

COST OF ACHIEVING E.P.A.'S BPCTCA AND ZERO DISCHARGE.
For primary bibliographic entry see Field 5G.
W74-09748

6D. Water Demand

A TEST OF ALTERNATIVE MODELS FOR PROJECTING COUNTY INDUSTRIAL PRODUCTION AT THE 2, 3, AND 4-DIGIT STANDARD INDUSTRIAL CODE LEVELS,
Livingston Coll., New Brunswick, N.J.
For primary bibliographic entry see Field 3E.
W74-09551

THE INFLUENCE OF DRAW-DOWN ON RECREATION ON THE TRENT CANAL RESERVOIR-LAKES,
Toronto Univ. (Ontario). Faculty of Forestry.
For primary bibliographic entry see Field 4A.
W74-09555

HYDRAULICS OF A WATER SUPPLY SYSTEM WITH FLUCTUATING WATER DEMAND, (HYDRAULIK EINES WASSERVERSORGUNGSSYSTEMS MIT FLUKTUIERENDEN BEDARFSMENGEN),
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 8B.
W74-09726

6E. Water Law and Institutions

REPORT ON GREAT LAKES WATER QUALITY FOR 1972.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5G.
W74-09257

ENVIRONMENTAL STATEMENTS--ENGINEER REGULATIONS ON PREPARATION AND COORDINATION.
Corps of Engineers, Washington, D.C.
Federal Register, Vol 37, No 22, p 2525-2530, February 2, 1972.

Descriptors: *Administrative agencies, *Legislation, *Environmental effects, *Federal government, Governments, Regulation, Water resources, Water resources development, Planning, Inter-agency cooperation, Environment, Environmental control, Environmental effects.
Identifiers: *Environmental impact statement(EIS), Administrative regulations.

The purpose of this regulation is to facilitate and promote compliance with the requirements of the National Environmental Policy Act of 1969 regarding the preparation and coordination of environmental statements. The regulation outlines procedures to be followed and elements to be included in preparing and processing environmental statements as required by the Act. The regulation applies to all elements of the Corps of Engineers with civil works responsibilities for planning, development and regulation of water resource development and is applicable to both preauthorization and postauthorization project activities. (Flowers-Florida)
W74-09258

CLEAN WATER--A CHALLENGE TO THE NATION, HIGHLIGHTS AND RECOMMENDATIONS OF THE NATIONAL CONFERENCE ON WATER POLLUTION.
Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-09260

REPORT OF PROCEEDINGS CONCERNING THE RECLASSIFICATION OF VARIOUS STREAMS IN NORTH CAROLINA, SECTION

III, KINSTON PUBLIC HEARING MARCH 1, 1973.
North Carolina Board of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 4A.
W74-09275

REPORT OF PROCEEDINGS CONCERNING THE RECLASSIFICATION OF VARIOUS STREAMS IN NORTH CAROLINA, SECTION II, SOUTHERN PINES PUBLIC HEARINGS NOVEMBER 2, 1972.
North Carolina Board of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 4A.
W74-09276

OFFSHORE SHRIMP FISHERIES ACT OF 1973--LEGISLATIVE HISTORY.
U.S. Code Congressional and Administrative News, p 5959-5973, 1973.

Descriptors: *Commercial fishing, *International waters, *Shrimp, *Continental Shelf, *Legislation, International law, Legal aspects, Law of the sea, Foreign waters, Treaties, Shellfish, Lobsters, Fishing, Permits, Fisheries, Federal government, Administrative agencies, Aquatic life, Natural resources.

The Senate Report submitted by the Commerce Committee recommends implementing the United States-Brazil shrimp fishing agreement and enforcing it as to United States fishermen. A history is included of the agreement which consolidates United States interests in maintaining access to disputed coastal waters for United States fishermen and Brazilian interests in insuring that its shrimp resources will not be overexploited. The enactment is necessary in order for the United States to fulfill its obligations under the agreement. An amendment to the bill which would declare the lobster a Continental Shelf fishery resource is recommended. By international agreement, the coastal state has sovereign rights to exploit its shelf resources. The agreement sets a number of annual fishing permits to be issued by the Secretary of Commerce and only permitted vessels may fish in the designated area of agreement. Violators may be penalized up to $10,000. Fishermen who have deposited enforcement reimbursement funds are given priority when applying for permits. Letters are included in which the Department of State and the Department of Commerce recommended the enactment of the bill and other agencies have made no objection. (Hunter-Florida)
W74-09277

FINAL ENVIRONMENTAL STATEMENT, (OFFICE OF SALINE WATER)--FIVE YEAR EXTENSION RESEARCH AND DEVELOPMENT, PUBLIC LAW 92-60.
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 3A.
W74-09280

FLORIDA'S SEAWARD BOUNDARIES--A DILEMMA,
Miami Univ., Fla. Ocean Law Program.
M. S. Scott.
Sea Grant Technical Bulletin, No. 20, January 1972. 114 p, 10 map, 1 append, 233 ref. NOAA 2-35147.

Descriptors: *Florida, *Atlantic Ocean, *Gulf of Mexico, *Ownership of beds, *Boundary disputes, *Submerged Lands Act, Coasts, Low water mark, High water mark, Seashores, Beds under water, Navigable waters, Tidal waters, Jurisidication, State jurisdiction, Federal jurisdiction, Water law, Legal aspects, Judicial decisions, Islands, Federal-state water rights conflict.
Identifiers: Baselines.

Florida has the greatest tidal coastline of any mainland state, approximately 8426 statute miles. However, the location of Florida's ocean boundaries awaits determination. Establishment of these boundaries is important, given the wealth of resources man is now capable of extracting from the ocean floor. Much of the law in this area has grown out of the recent Tidelands Cases. In these cases the Supreme Court held that the United States government had authority over submerged lands seaward of the mean low water mark. Congress reacted by enacting the Submerged Lands Act in 1953, which gave coastal states ownership and proprietary powers over lands under navigable waters for a distance of 3 miles in the Atlantic and Pacific Ocean or 9 nautical miles in the Gulf of Mexico. The matter of boundaries is not yet decided, however, because Florida, in litigation which is still continuing, has claimed the same limit on its Atlantic coast which it was given on its Gulf coast. In addition, Florida's many islands and bays present problems in determining the baseline from which to measure the extent of her territorial waters. (Flowers-Florida)
W74-09281

UTAH ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSE: PART 1,
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5G.
W74-09282

PROTECTING AMERICA'S ESTUARIES: FLORIDA (PART 2).
For primary bibliographic entry see Field 5G.
W74-09283

APPRAISAL OF AQUATIC PRESERVES IN FLORIDA,
Miami Univ., Fla. Ocean Law Program.
B. H. Dubner.
Report No. 6, November, 1973. 14 p. R/L-5.

Descriptors: *Florida, *Submerged lands, *Beds, *Aquatic environment, *Preservation, *Dedication, Conservation, Aquatic life, Riparian rights, Ownership of beds, Marine animals, Marine plants, Aquatic plants, Marshes, Wetlands, Mangrove swamps, Reefs, Shallow water, Inter-agency cooperation, State governments, Administrative agencies.

A report submitted to the Florida Board of Trustees of the Internal Improvement Fund by the Interagency Advisory Committee on Submerged Land Management is analyzed. Florida owns some 10,000 square miles of submerged lands and the natural systems of these coastal waters are having a difficult time co-existing with man. The report recommends the dedication of exceptional areas of these coastal waters to preserve biological life, to preserve scenic qualities, and to further scientific and educational purposes. The report recommends that the sites for dedication by selected by the Board of Trustees according to recommendations made by various federal and state agencies and integrated by an inter-agency committee. The Board should be responsible for the management of the preserves and should locate the specific preserves by resolution. The Board's adoption and implementation of the report's recommendations are discussed. The Board adopted a concept and management polocy in 1969 which set in motion action on specific aquatic preserve resolutions. It has approved the report's twenty-six recommended preserves and several additional sites. Statutory powers and duties of the Board as a source of implied authority to set up aquatic preserves are discussed. (Hunter-Florida)
W74-09285

THE EAST CHINA SEA: THE ROLE OF INTERNATIONAL LAW IN THE SETTLEMENT OF DISPUTES.
Duke Law Journal, p 823-865, Spring 1973. 153 ref.

Descriptors: *Continental shelf, *Law of the sea, *International law, *International waters, *Oceans, Treaties, Foreign waters, Legal aspects, Ownership of beds, Governments, Water law, United Nations, Exploration, Natural resources, Oil.
Identifiers: *China Sea.

International law has two weaknesses when used as a method of solving international legal disputes. Either the states will not submit the dispute to a third party, or the relevant legal principles may not be sufficiently developed to provide for resolution of the conflict. These weaknesses are manifested in the disputes surrounding exploration rights to the continental shelf of the East China Sea and the ownership of the Senkaku Islands in that sea. The governments of China, Taiwan, South Korea, and Japan claim rights to the continental shelf which conflict with each other. The delicate political situation, especially between China and Taiwan, precludes submission of the dispute to a third party; the law of the territorial sea and the continental shelf is not sufficiently settled to provide a solution. The development and current state of the law of the sea, and how it applies to the conflicting claims of the countries surrounding the East China Sea is discussed. While international legal principles will not be responsible for the resolution of this problem it is encouraging that the rhetoric of international law is used by the participants. (Craig-Florida)
W74-09286

SEABED MINERAL RESOURCE PRODUCTION AND THE FREE MARKET,
J. M. Marcoux.
Natural Resources Law, Vol 6, p 217-248, Spring 1973. 98 ref, 1 append.

Descriptors: *Law of the sea, *Oceans, *Economics, *Resource allocation, *Natural resources, Evaluation, Contracts, Exploration, United Nations, Water law, International waters, Governments, Ownership of beds, Legal aspects, Treaties, International law, Continental shelf.2 (U)2jIdentifiers: Coastal waters.

Laws governing the efficient recovery of mineral resources of seabeds will constitute an important part of the law of the sea. Addressed are two questions with respect to such a mineral recovery law: whether individual profit-maximizing decisions in a free seabed mineral development market are the best means to achieve a socially optimal use of seabed minerals; and whether competitive losses of existing mineral producers, displaced by seabed production, should be compensated. Various countries' proposals for legal controls on seabed mineral production and prices and for the protection of present mineral producers are examined. These proposals and their implications with the experience of the United States in regulation of the oil industry are compared. Utilization of a free-market competitive model for any international seabed authority is proposed. Additionally, the use of a unitization contract is suggested, whereby title to production is pooled among the lessees, to promote conservation of the natural resources. (Craig-Florida)
W74-09287

THIBODAUX PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
September 21, 1972. 60 p.

Descriptors: *Louisiana, *Water management, *Water development, *Coasts, *Conservation, Public rights, Estuaries, Estuarine environment, State governments, Administrative agencies,

Ecology, Natural resources, Water resources, Water resources development, Water policy, Planning, Land use, Land development, Land management, Fisheries, Wildlife, Oil industry, Recreation, Navigation, Channelization, Pollution effects, Drainage, Flood control, Mineralogy, Mississippi River Basin.

Public hearings were held in Thibodaux on September 21, 1972 to get first-hand information from the citizens of the coastal zone on their perception of coastal zone resource problems. Several industrial, environmental and political witnesses offered testimony. The testimony illustrated the competition and demand between those interests which depend upon an unchanged coastal zone and estuarine environment and those whose livelihood is dependent upon a modification of the existing coastal zone. Among those interests and values at stake are fisheries, wildlife, oil production, recreation, scenic value, tourism, shipping, navigation and channelization, conservation and preservation of the estuarine environments and control of pollution. Proper management, planning and development were emphasized by state agencies as well as drainage and flood control priorities. Landfill as a result of residential and industrial development was cited as an urgent concern, as was proper planning for well developed mineral resources development. (Silber-Florida)
W74-09288

AIR, LAND AND WATER POLLUTION.
Ill. Ann. Stat. Ch. 14, secs 11, 12 (Smith-Hurd Supp. 1973).

Descriptors: *Illinois, *Legislation, *Water law, *Pollution abatement, *Legal aspects, Water pollution, Air pollution, Water pollution control, Administrative agencies, Public health, Regulation, Judicial decisions, Remedies, Natural resources, Pollution effects.
Identifiers: Injunctive relief.

Authority is conferred to the Illinois state attorney general to prevent air, land or water pollution by commencing an action or proceeding in the circuit court of any county in which such pollution has been, or is about to be, caused or has occurred, in order to have such pollution stopped or prevented by mandamus or injunction. The court shall specify a time within twenty-one days after service of the petition, for an answer, and in the interim the party shall be restrained from continuing such pollution pending a hearing before the court. In case of default, or after answer, the court shall immediately inquire into the facts and circumstances complained of. An appeal may be taken from a final judgment in the circuit court in the same manner and with the same effect as appeals taken from any judgment of the circuit court in other actions for mandamus or injunction. (Silber-Florida)
W74-09289

CANALS AND WATERWAYS.
Ill. Ann. Stat., ch. 19, sec 1111, 1121, 1122 (Smith-Hurd Supp. 1973).

Descriptors: *Legislation, *Illinois, *Reservoirs, *Recreation, *Governmental interrelations, Water law, Rivers, Pollution, Pollution abatement, Recreation facilities, Wildlife management, Pollutant identification, Planning, Administrative agencies, Water pollution, Coordination, Cooperation, Development, State governments, Inter-agency cooperation.

Illinois Department of Conservation is authorized to enter into and carry out agreemets with any agencies of the United States government. The purpose of such agreements is to insure the performance of non-federal items in the acquisition of land, development, operation and maintenance of improvements of the Lincoln Reservoir on the Embarras River for the purpose of making certain portions of it suitable for public outdoor recreation, including the management of fisheries and wildlife. In the interests of the citizens of the state, immediate efforts shall continue to be taken to clean up the Little Calumet River. This may only be achieved through cooperative efforts of appropriate federal, state and local agencies. To coordinate this effort the Commission on Operation Little Calmet River has been established. The commission shall study and identify the factors relating to the river pollution, coordinate the river clean-up, and develop a handbook of procedures to be used by other communities with similar problems. (Silber-Florida)
W74-09290

SOIL AND WATER CONSERVATION DISTRICT LAW.
Ill. Ann. Stat. Ch. 5, secs 127 .2a, 128, 131b, 131b-1, 131b-6 (Smith-Hurd Supp. 1973).

Descriptors: *Legislation, *Illinois, *Water conservation, *Soil conservation, *Erosion control, Erosion prevention, Land use, Water management, Flood control, Watershed protection, Watershed management, Land management, Reforestation, Farm management, Structures, Environmental engineering, Cultivation sedimentation, Dams, Dikes.

The Illinois Soil and Water Conservation Districts are authorized to formulate regulations governing the use of lands in the interest of conserving soil, soil resources, water and water resources. The districts may also issue regulations to prevent and control damage caused by erosion, flood water and sediment. Before enacting such regulations a landowner's referendum shall be held within each district. The regulations may include provisions for necessary engineering requirements such as construction of terraces, check dams, dikes, and other structures, observation of particular methods of cultivation, seeding and planting of lands with water-conserving and erosion-preventing plants, trees and grasses. They may also include permanent retirement from cultivation of highly erosive areas, and such other measures that may promote conservation of soil and water resources and prevent or control soil erosion. Subdistricts may be formed in a watershed area to develop programs in any phase of flood prevention, flood control, erosion control, floodwater and sediment damage. (Silber-Florida)
W74-09291

DRAINAGE--SEWAGE DISPOSAL; CONTAMINATION OF LAKE MICHIGAN.
Ill. Ann. Stat., Ch. 42, sec. 306 (Smith-Hurd Supp. 1973).

Descriptors: *Drainage, *Legal aspects, *Legislation, *Illinois, Municipal wastes, *Lake Michigan, Sewage disposal, Sewage districts, Sewerage, Waste water disposal.

The following topics are considered: contamination of Lake Michigan by sewage disposal; acquisition and maintenance of sanitary facilities; control of tributary sewer systems; construction standards for tributary sewer systems; and inspection of sewage connections. The board of trustees of any sanitary district is authorized to provide for the disposal of sewage. It is not to be construed to empower said trustees to provide water to a municipality or its inhabitants or to authorize the trustees to flow the sewage into Lake Michigan. Nothing in the act shall be construed as superseding the limiting provisions of the Environmental Protection Act. (Sears-Florida)
W74-09292

REGULATION AND RESTRICTION OF LOCATION AND USE OF STRUCTURES IN REGARDS TO RUNOFF OF STORM OR FLOOD WATERS.
Ill. Ann. Stat., ch. 34, sec. 3151 (Smith-Hurd Supp. 1973).

Descriptors: *Illinois, *Legislation, *Runoff, *Storm runoff, *Floodwater, *Zoning, Local governments, Regulation, Water pollution sources, Flood damage, Flow.

The board of supervisors or board of county commissioners is given the power to regulate and restrict the location and use of buildings, structures and land for trade, industrial, residential, and other uses, and to regulate and restrict the intensity of such uses. They are also empowered to divide the entire county outside the city limits into districts according to the use of land and buildings and other classifications as are necessary, to prohibit uses incompatible with the character of such districts, and to prevent additions and alterations to buildings in such a manner as to avoid these restrictions. One of the primary purposes of this act is to lessen or avoid the hazards to persons and damage to property resulting from the accumulation or runoff of storm or flood waters. (Sears-Florida)
W74-09293

SANITARY DISTRICTS.
Ill. Ann. Stat. Ch. 34, sec. 3131 (Smith-Hurd, Supp. 1973).

Descriptors: *Illinois, *Legislation, *Sewage districts, Sewerage systems, Sewage disposal, Governments, Sewerage, Sanitary engineering.

Any sanitary district organized and created under the laws of the state of Illinois having a population of less than 500,000 and lying wholly or partly within the boundaries of any county which accepts the provisions of 'An Act in relation to water supply, drainage, sewage, pollution and flood control in certain counties' may contract with such county for sewerage service to or for the benefit of the inhabitants of the sanitary district. Any such contract may provide for the periodic payment to the county of a share of the amounts necessary to pay or provide for the expenses of operation of the sewerage systems. Any such contract may be entered into without making a previous appropriation for the expense thereby incurred. If the contract is payable solely from the revenues derived by the sanitary district from its sewerage system, the amounts due under the contract shall be deemed an expense of operating and maintaining the sewerage system of the sanitary district. (Sears-Florida)
W74-09294

FISH PROTECTIVE REGULATIONS.
Ill. Ann. Stat., ch. 56, sec. 2.1 (Smith-Hurd Supp. 1973).

Descriptors: *Illinois, *Fish, *Fish management, *Pollution, *Legislation, Water pollution, Aquatic animals, Minnows, Frogs, Turtles, Mussels, Crayfish, Sewage disposal, Regulation.
Identifiers: Fish protective regulations, Fish ownership, Title to fish.

The ownership of and title to all fish, minnows, frogs, turtles, mussels, and crayfish within the jurisdiction of the State of Illinois is in the State. They may not be taken or killed unless the person so doing acknowledges that the title thereto shall be and remain in the State for the purpose of regulating the taking, killing, possession, use, sale, and transportation thereof. If any person causes any wastes or sewage to be discharged into, or causes or allows pollution of any waters so as to kill aquatic life, the State may bring an action against such person and recover the reasonable value of the aquatic life destroyed. If any person leaves any debris where it shall be liable to be washed into the waters he shall be in violation of the offense of polluting. (Sears-Florida)
W74-09295

REID V. EL PASO CONSTRUCTION CO. (DAMAGES FOR ALTERATION OF DRAINAGE CONDITIONS).
408 S.W.2d 923 (Texas 1973).

Descriptors: *Texas, *Controlled drainage, *Judicial decisions, *Surface drainage, Drainage engineering, Drainage water, Drainage systems, Ditch, Legislation, Legal aspects, State governments, Court decisions, Drainage practices, Drainage effects.
Identifiers: *Natural drainage.

The plaintiff landowners alleged that the defendant El Paso Construction Company had fraudulently concealed evidence of the alteration of natural drainage conditions. The concealment was in connection with three tracts of land which the defendant sold to the plaintiffs. The plaintiffs alleged that rains caused flooding and serious damage to their property. The plaintiffs also asserted an action against both the city of El Paso and Farah Manufacturing Company for the unlawful diversion of water from its natural course in violation of a Texas statute. Farah had constructed a large building which covered several natural arroyos and directed the drainage flow into an artificial conduit. The court noted that any alteration of natural or artificial drainage conditions is not permitted without a prior authorization from the state and held for plaintiffs. (Sperling-Florida)
W74-09296

BEACH AND SHORE PRESERVATION ACT.
Fla. Stat., sec. 161.091 (Supp. 1972).

Descriptors: *Florida, *Beaches, *Shore protection, *Beach erosion, *Legislation, Public benefits, Erosion control, Conservation, Coastal engineering, Administrative agencies, Cost sharing, State governments, Project planning, Hurricanes, Tidal effects.
Identifiers: *Administrative regulations.

A state account is created to carry out the proper state responsibilities in a comprehensive, long range, statewide plan for erosion control, beach preservation, and hurricane protection. The statute provides for disbursements to be made by the division of marine resources of the Florida department of natural resources. It allows the state to undertake projects which are in the interest of the state. Additionally loans or grants can be made to localities for erosion control, beach preservation, and hurricane protection work of an emergency nature. (Sperling-Florida)
W74-09297

WATER RESOURCES-POWERS OF THE COMMISSIONER OF NATURAL RESOURCES.
Minn. Stat. Ann., secs. 105.38, 105.41, 105.42, 105.43, 105.51, 105.52 (Supp. 1973), as amended, ch. 315, secs. 1, 2, 3, 6, 8, ch. 344, secs. 4, 5 (1973) Laws of Minn.

Descriptors: *Water conservation, *Water resources development, *Appropriation, *Water resources, *Water supply, *Administration, Minnesota, Legislation, Project purposes, State governments, Inter-agency cooperation, Water distribution(Applied), Inspection, Water level, Water works, Permits, Construction, Dams, Reservoirs, Regulation.

The duties of the commissioner of natural resources shall include establishing and maintaining a statewide system to gather, process and disseminate information on the availability, distribution, quality and use of the state of Minnesota's waters. The appropriation and use of state waters is regulated through the issuance of permits, obtained from the commissioner, who may promulgate conditions for permits as he may find advisable or necessary in the public interest. The commissioner may examine any installation which appropriates or uses surface or underground water and the owner shall supply information concerning the installation. Also, application for establishment of lake levels and the maintaining of natural ordinary high levels may be made to the commissioner, by any public authority or by a majority of the riparian owners thereon. The statute also regulates dams, and places authority for their repair and reconstruction with the commissioner. The commissioner can examine dams and reservoirs, order repairs and issue orders stating reasonable time periods in which such repairs must be completed, at the owner's expense. Further, the commissioner is also given the authority to require owners of artesian wells to control wastes. (Sutton-Florida)
W74-09298

MONTGOMERY V. ELLIS (ACTION SEEKING TO ENJOIN STREAM CHANNELIZATION).
364 F. Supp. 517-535 (N.D. Ala. 1973).

Descriptors: *Judicial decisions, *Streams, *Channelization, *Environmental effects, *Project planning, *Alabama, Construction, Cost-benefit ratio, Dams, Environment, Watersheds(Basin), Water storage, Costs, Flood control, Alternative planning, Flood plain zoning, Insurance, Non-structural alternatives, Recreation, Legal aspects, Federal government, Administrative agencies, Water law, Water policy, Water management, Standards, Regulations.
Identifiers: Environmental Impact Statements, National Environmental Policy Act(NEPA), Injunctive relief.

Action is by a landowner against officials of the Soil Conservation Service (Service) of the Department of Agriculture, seeking to enjoin the implementation or construction of a stream channelization project. The District Court held the filed statement to be insufficient as an environmental impact statement, and that the Service had failed to give effect to the National Environmental Policy Act requirement that all federal agencies exercise a continuing responsibility regarding projects which might affect the environment. In addition, service officials had failed to follow their own departmental regulations in approving this project. The Court further held that the defendants would be enjoined from construction, installing, or further authorization or financing any stream modification or channelization of the creek in question until an adequate environmental impact statement was prepared and circulated. The project was ordered to be reappraised so as to reduce adverse environmental effects and to develop a more favorable cost-benefit ratio. (Ritchie-Florida)
W74-09299

PROTECTION AND IMPROVEMENT OF WATERS: POLLUTION CONTROL.
Me. Rev. Stat. Ann., Vol 16, tit. 38, secs. 411-424 (Supp. 1973).

Descriptors: *Maine, *Water pollution control, *Legislation, *Discharge, *Environmental control, Abatement, Outfall sewers, Interceptor sewers, Wastes, Refuse, Waste treatment, Permits, Pollutants, Phosphates, Oil pollution, Water quality control, Sewage treatment, Inland waterways, Water quality, Water quality standards.
Identifiers: Environmental protection, Forest product refuse.

Maine's legislature passed this pollution control statute in order to establish a state commission which would cooperate with federal agencies to control pollution within its borders. The state authorized money grants to localities for waste treatment systems, interceptor systems and outfalls. Additionally, grants were authorized for the funding of a pollution abatement construction program by municipalities. The statute prohibits discharges without first obtaining a license from the state. Provisions for the license's application, terms, conditions, fees, and hearings were established. Generally the licenses for discharge of any pollutants will be granted only if it will not lower the quality of the body of water in which it is discharged, keeping in mind economic and social development considerations. Discharges of oil, forest product refuse and metal scraps is strictly prohibited as is any cleaning agent containing phosphate. Likewise, discharge of wastes from water crafts is restricted in the inland waters or banks of the state of Maine. Also voluntary water quality monitors may be appointed by the Commissioner of Environmental Protection to continually test and provide information on water quality to the Commissioner. (Daniels-Florida)
W74-09300

WETLANDS.
Md. Code Ann., art. 66C, sec. 718-731 (Supp. 1973).

Descriptors: *Legislation, *Maryland, *Wetlands, *Erosion control, *Riparian rights, *Conservation, Reclamation, Avulsion, Accretion, Dredging, Filling, Boundaries, Bank erosion, Navigable waters, Land use, Land management.

The natural person who is a landowner of property abutting on navigable waters is entitled to all natural accretions to his land, and to reclaim fast land lost by erosion or avulsion and to make improvements into the waters for the purposes of protecting his shore against erosion and preserving his access to navigable waters. Riparian owners may apply to the Maryland State Board of Public Works for a license to dredge and fill on state wetlands. Private wetlands may be lawfully used for conservation of soil, vegetation, water, fish, shellfish and wildlife, as well as for trapping, hunting, fishing and shellfishing where otherwise legally permitted. The Secretary of Natural Resources shall delineate the landward boundaries of all wetlands within the state. Applications to conduct activities not permitted by the rules and regulations may be made to the Secretary. (Silber-Florida)
W74-09301

U.S. V. POLLMANN (DETERMINATION OF INDIAN LANDS UNDER LAKE).
364 F. Supp. 995-1004 (D. Mont. 1973).

Descriptors: *Treaties, *Lakes, *Public rights, *Judicial decisions, *Indian reservations, *Legislation, Navigation, Surface water, *Montana, Fisheries, Administration, Permits, Third party effects, Political aspects, Water utilization, Water management, Standards, Legal aspects, Federal reservations, Water law, Water policy, Submerged land, Public rights, Regulation, Federal jurisdiction, Water rights.

This was a test case to determine whether 18 U.S.C. sec. 1165 would be applicable to a private individual fishing on a portion of a lake given to Indian tribes through a treaty. The court held the word 'land' used within the statute was to mean submerged soil beneath a lake, or to include surface water itself. Trespass upon Indian land for purposes of fishing was not ambiguous language and such language clearly included fishing from a boat. The right granted Indian tribes by treaty to exclusive fishing rights on the southern half of the lake included the right to exclude others from fishing and was not in conflict with the public right to use the surface of the lake for navigation. Although the court found a violation of the statute had occurred, they found the defendant not guilty, stating that as this was a test case and willful knowledge was an essential element of the crime, he could not be adjudicated guilty because he had sought an attorney in good faith, for the purpose of securing advice about the lawfulness of his possible future action. As he reported all material facts accurately to the attorney, and acted strictly in accordance with his advice, he could not be found guilty of a willful violation of the law. (Sutton-Florida)
W74-09302

SEDIMENTATION POLLUTION CONTROL ACT OF 1973.
N.C. Gen. Stat., secs. 113A-50 thru 113A-66 (1973).

Descriptors: *Sediment control, *Legislation, *Multiple-purpose projects, *North Carolina, Sediment discharge, Sediment load, Watershed management, Bank erosion, Soil erosion, Judicial effects, State agencies, Enforcement, Regulations, Water law, State governments, Local governments, Rivers, Lakes, Land management, Land development, Water pollution control, Water pollution sources.
Identifiers: *Injunctive relief.

The authority of this North Carolina act is predicated upon the need to control the pollution problem created by the sedimentation of streams, lakes and other waters and the public interest in erosion and sedimentation control. The creation, administration, and enforcement of a program to decrease pollution caused by sedimentation are proposed. The act provides for the creation of a sediment control commission within the North Carolina Department of Natural and Economic Resources. Specifications are set forth for membership and compensations. The Commission is charged with the promulgation, development and administration of the state's erosion and sedimentation control program and shall develop rules and regulations implementing the program. Public hearings will be held prior to any adoption or revision of the rules and the criteria to be employed for such adoption or revision are outlined. The Secretary of Natural and Economic Resources shall aid in program administration. Restrictions are delineated respecting land-disturbing activities. The Commission may promulgate procedures for consideration of local control programs and provide for the enforcement of the provisions by enacting civil and criminal penalties. (Proctor-Florida)
W74-09303

CONTAMINATION OF WATERS.
N.H. Rev. Stat. Ann., ch. 211:71 to 211:74 (Supp. 1972).

Descriptors: *Water pollution, *Aquatic environment, *Waste water(Pollution), *Water conservation, *Water supply, *New Hampshire, Legislation, Water policy, Statute, Water resources development, Public health, Administration, Wildlife, Environmental effects, Water pollution sources, Waste disposal, Coasts, Water pollution effects, Inland waterways.

A statute was enacted for the prevention of inland and coastal water contamination. Whoever unlawfully discharges contaminants into these waters will be liable for any damage to fish or other aquatic life and wildlife. Any such damage shall be investigated by the director of the New Hampshire department of fish and game, or his agent, and he shall determine the party responsible and then compute the damages based on tables promulgated by the department or by such other means as he deems reasonable and accurate. If the offense becomes one of a continuing nature, the director shall notify any other state department authorized to seek injunctive relief against water pollution. After the director determines that the damage to fish, other aquatic life and wildlife so warrants, he shall request the attorney general to institute an action at law for damages caused by such contamination. (Sutton-Florida)
W74-09304

RIGHT OF PRIVATE PARTY TO MAINTAIN ACTION TO ENFORCE PROVISIONS OF RIVERS AND HARBORS ACT OF 1899,
M. Shulenberger.
15 ALR Fed. 636 (1973). 22 p.

Descriptors: *Judicial decisions, *Federal government, *Legal aspects, *Pollution abatement, *Water policy, *Rivers and Harbors Act, Waterways, Streams, Rivers, Navigable waters, Navigation, Pollution sources, Environmental effects, Water rights, Public rights, Environmental sanitation, Industrial pollution, Waste dumps, Sewage discharge, Sewage disposals, Administrative agencies.

This annotation collects cases dealing with the right of a private party who claims no injury to a navigational interest to bring an action against an alleged polluter of the nation's waterways, or against the alleged polluter and governmental officials, in attempted enforcement of provisions of the Rivers and Harbors Act of 1899. Various sections of that Act make it unlawful to deposit refuse in navigable waters and their tributaries unless a permit to do so has been issued to the polluter. The Act also provides that half of the fine assessed shall go to the person supplying the information concerning the violation. Idle until the 1970's, this statute enables private citizens to bring a 'qui tam' action against the violator if the government failed to prosecute. No private damages need be shown by the plaintiff, and the suit is brought by the plaintiff for himself as well as for the government. The United States Supreme Court has endorsed this 'qui tam' action as 'helping to ensure against laxity by public officials in enforcing statutes effectuating important public policies.' Various lower federal courts have put procedural impediments in the citizen's way, especially regarding standing, resulting in the informant being only the government's witness in prosecutions rather than permitting him his own cause of action. (Silber-Florida)
W74-09305

LIABILITY OF WATER SUPPLIER FOR DAMAGES RESULTING FROM FURNISHING IMPURE WATER,
J. T. Bockrath.
54 ALR3d 936 (1973).

Descriptors: *Judicial decisions, *Potable water, *Public utilities, *Municipalities, *Legal aspects, State governments, Jurisdiction, Water rights, Water policy, Water demand, Water supply, Domestic water, Environmental sanitation, Public health, Water purification, Water control, Water quality, Water quality control, Water utilization, Water distribution, Contaminants, Pollutants, Administrative agencies.

This annotation collects the cases in which the liability of a private municipal water supplier for damages resulting from furnishing impure water has been determined. Sound public policy makes incumbent upon water suppliers a duty of a high degree of care in furnishing a supply adequate in quantity and wholesome in quality. Damage from impure waters most often takes the form of disease or poisoning. Actions for these injuries have taken many forms, the most popular being negligence, implied warranty and warranty. Depending upon the individual jurisdiction involved, municipal water suppliers are held to be public utilities or acting in a proprietary fashion. Exceptions to a municipality's liability for furnishing impure water have arisen when the agency, acting in a governmental capacity, supplied water in an emergency situation to avoid a health hazard. Generally, the presumption of negligence or breach of warranty is against the supplier, but can be rebutted by establishing facts and circumstances which would excuse or acquit the utility. (Silber-Florida)
W74-09306

WILD AND SCENIC RIVERS ACT AMENDMENTS PART 1.
Hearings--Before the Subcomm on National Parks and Recreation of the Comm on Interior and Insular Affairs, U.S. House of Representatives, 93d Cong, 1st Sess, June 11, 12, 1973. 161 p.

Descriptors: *Federal government, *Wild River Act, *Legislation, *Scenery, Decision making, Water policy, Recreation, Water conservation, Water resources development, Project planning, Administration, Budgeting, Coordination, Social aspects, Project purposes, Electric power industry, Regulation, Engineering structures, Allotments, Water allocation(Policy), Government finance, Rivers, Aesthetics, Conservation, Running waters.
Identifiers: *Congressional hearings, Administrative regulations.

One amendment to the Wild and Scenic Rivers Act deals with increased appropriation for so-called instant rivers which were added to this system in 1968. Other amendments concern specific additions to the study sections of the act which would permit several rivers, or segments of rivers, to be studied for possible inclusion into the Scenic Rivers System. Congressmen from several states made statements concerning the inclusion of rivers in their respective states in the National Scenic Rivers System. The administration has proposed a bill which would prohibit the Federal Power Commission from licensing any project directly affecting any of the twenty-seven rivers listed in the act for study. Another provision would prohibit any federal agency from assisting in the construction of any water resource project that would have a direct and adverse effect on a river's wild or scenic values. Another provision would prevent federal agencies from recommending authorizations or appropriations for construction of water resource projects without reporting potential conflicts with the purposes of the Wild and Scenic Rivers Act. (Sperling-Florida)
W74-09307

TO AMEND THE WILD AND SCENIC RIVERS ACT.
Hearing--Subcomm. on Public Lands, Comm. on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, July 16, 1973. 74 p, 2 map.

Descriptors: *Wild Rivers Act, *Legislation, *Rivers, *Watershed management, *Recreation, *Pollution prevention, Water law, Legal aspects, Federal government, Water policy, Administrative agencies, Coordination, Cooperation, Wildlife management, Fishlife, Land management, Land use, Navigable waters, Conservation, Natural resources, Water resources development, Pollution control, Project planning, Streams.

This bill would add certain rivers in the state of Michigan to the national wild and scenic rivers system. Also proposed are additions to the system of rivers in Wisconsin. Various witnesses spoke as to the beneficial aspects of these proposed additions to the system, citing water and forest conservation and management as paramount interests. Conservation of the nation's land and water resources and recreational aspects as well as fishlife and wildlife preservation and protection were also cited. In addition, these rivers would enjoy the protection against pollution and overdevelopment which characteristically blemish non-protected waterways. Aggressive federal-state interaction and cooperation will be a beneficial effect of the proposed addition to the scenic river system. Results of various field investigations concerning several rivers already in the system were entered into the record as evidence of the value of the program. (Silber-Florida)
W74-09308

REPLACEMENT OF THE AMERICAN FALLS DAM IN IDAHO, PART 1.
Hearing---Before the Subcomm on Water and Power Resources of the Comm on Interior and Insular Affairs, U.S. House of Representatives, 93d Cong, 1st Sess, October 6, 1973. 119 p.

Descriptors: *Idaho, *Federal government, *Legislation, *Dam construction, *Hydroelectric

plants, Water supply, Flood control, Irrigation systems, Irrigation water, Irrigation efficiency, Water demand, Water sources, Reservoir operation, Reservoir storage, Water distribution(Applied), Wildlife management, Conservation, Water yield improvement, Water yield, Safety, Economic justification, Government finance, Participating funds.
Identifiers: *Congressional hearings.

The proposed legislation would authorize the Secretary of the Interior to enter into agreements with non-federal agencies for the replacement of the American Falls Dam in Idaho which also serves a reservoir and powerplant. The existing dam has been determined to be unsafe, and the reservoir is operating two thirds below its capacity. Nine-hundred-thousand acres of land receive irrigation from the reservoir. Constraints on operation of the dam will pose serious threats to the agricultural economy of southern Idaho, and also to the recreation, fish and wildlife, flood control, and hydroelectric power functions served by the reservoir system. The roadway on the crest of the existing dam is the only crossing within an eighty-mile reach of the river. The financing of the dam would be private by an appropriate water users agency. Ownership would be transferred to the federal government for operation and maintenance. The water users agency would be authorized to contract with the power company for use of the water to defray construction expenses. (Sperling-Florida)
W74-09309

PROPOSED WILD AND SCENIC CHATTOOGA RIVER AND THE CONVEYANCE OF CERTAIN PUBLIC LANDS.
Hearings---Subcomm on Public Lands, Comm on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, October 10, 1973. 108 p.

Descriptors: *Legislation, *Water law, *Rivers, *Legal aspects, *Federal government, Recreation, Conservation, Water management, Water development, Water policy, Natural resources, Water resources, Water resources development, Project purposes, Planning, Long-term planning, Scenery, Wild rivers, Scenic easements, Wildlife conservation, Land management, Land development, Water utilization.
Identifiers: *Chattooga River.

The proposed designation of the Chattooga River as wild and scenic and the conveyance of certain other public lands are discussed. The proposed bill notes the fundamental purposes of such a designation, the purposes being to conserve the river's natural and scenic values and to provide for their use and enjoyment by the public in perpetuity. Testimony regarding the proposals was submitted and ranged from comments on feasibility and development possibilities to concurrence on the ideas embodied within the proposed legislation by the President's Office. The remainder of the hearings and testimony introduced regarded transfer and conveyance of certain public lands held by the United States to various state and local political agencies as well as to several corporations and religious entities. The sites of said proposed conveyances include lands in Alaska, Idaho, Oregon, New Mexico, and Arizona. (Silber-Florida)
W74-09310

A BILL TO AMEND THE OUTER CONTINENTAL SHELF LANDS ACT AND TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO REGULATE THE CONSTRUCTION AND OPERATION OF DEEPWATER PORT FACILITIES,
Senate Bill 1751, 93d Cong, 1st Sess (1973). 19 p.

Descriptors: *Legislation, *Oil, *Oil industry, *Harbors, *Continental shelf, Construction, Permits, Environment, Environmental effects, Ships, International waters, Navigation, Mineralogy, Natural resources, Public health, Coasts, Exploration, Exploitation, Penalties(Legal), Water quality, Water quality control, Standards, Regulation, Federal government, Oceans, Sea water, Navigation, Ports, Structures, Environmental engineering, Water policy, Water utilization.
Identifiers: *Deepwater ports.

This bill, to be cited as the Deepwater Port Facilities Act of 1973, amends the Outer Continental Shelf Lands Act. It provides that the Secretary of the Interior shall prescribe such rules and regulations as may be necessary to accomodate the exploration and exploitation of the oil and gas and other mineral resources of the Outer Continental Shelf with construction and operation of deepwater port facilities licensed by him. This is necessary due to the inadequacy of onshore port facilities to accommodate some of the large vessels increasingly used in ocean shipping. It is also designed to eliminate the environmental hazards inherent in the increasing traffic in United States harbors and the resulting danger to public health. No citizen may construct, operate or make any significant addition to a deepwater port facility without first receiving a license from the Secretary. The Secretary may issue the license if it is determined that the applicant is financially responsible, that the construction and operation will not interfere with navigation, and that the facility will be operated so as to minimize adverse environmental effects. (Ritchie-Florida)
W74-09311

A BILL TO AMEND THE OIL POLLUTION ACT, 1961 (75 STAT. 402), AS AMENDED TO IMPLEMENT THE 1969 AND 1971 AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF THE POLLUTION OF THE SEA BY OIL, 1954, AS AMENDED; AND F OR OTHER PURPOSES,
House Bill 5451, 93d Cong, 1st Sess (1973). 13 p.

Descriptors: *Legislation, *Oil, *Oil pollution, *Oil spills, International waters, Water pollution, Water pollution sources, Water pollution control, Ships, Harbors, Treaties, International law, Water law, Coasts, Oily water, Oil wastes.

The Oil Pollution Act Amendments of 1973, repeal, amend, deplete and redesignate numerous sections of the Oil Pollution Act of 1961. Also numerous provisions are added, including a definition of 'instantaneous rate of discharge of oil content,' which shall mean the rate of discharge of oil in liters per hour at any instant divided by the speed of the ship in knots at the same instant. The discharge of oil or oily misture from a ship is prohibited unless the instantaneous rate of discharge of oil content does not exceed sixty liters per mile. For a ship other than a tanker, the oil content must also be less than one hundred parts per one million parts of the mixture and the discharge must be made as far as practicable from land. For a tanker, except discharges from machinery space bilges which are governed by the above provisions, the total quantity of oil discharged on a ballast voyage must not exceed one part in fifteen thousand of the total cargo-carrying capacity, and the tanker must be more than fifty miles from the nearest land. Compliance with tanker construction specifications is required and the Secretary of State may deny access to foreign vessels not meeting those requirements. (Ritchie-Florida)
W74-09312

A BILL TO ASSURE THAT THE PUBLIC IS PROVIDED WITH SAFE DRINKING WATER, AND FOR OTHER PURPOSES.
House Bill 5368, 93d Cong, 1st Sess (1973). 19p.

Descriptors: *Federal government, *Legislation, *Potable water, *Public health, Water quality, Water quality control, Standards, Regulation, Administrative agencies, State governments, Municipalities, Water policy, Water supply, Water demand, Water purification, Treatment facilities, Pollution control, Navigable waters(Drinking water), Environmental sanitation, Water management, Water distribution.

The Safe Drinking Water Act of 1973 takes legislative notice that potentially hazardous drinking water is reaching many consumers due to inadequate treatment and distribution facilities, and a lack of sufficient information and technology to adequately treat raw water to assure its potability. The Act recognizes that the primary responsibility and enforcement authority for ensuring the quality of public water supplies has rested and should continue to rest with state and local governments. The federal government has the responsibility for establishing minimum national primary drinking water standards for all public water systems. The Administrator for the Environmental Protection Agency shall establish such standards which are requisite to reasonably protect the public health and welfare, except the Administrator shall not prescribe the addition of any substance other than for the purpose of treating contaminants. Included shall be standards for the adequate monitoring and reporting of water quality. When the Administrator determines an imminent hazard exists, a condition which could result in a serious risk to public health, he may petition the appropriate United States District Court to order such action as is necessary to eliminate the imminent hazard. (Silber-Florida)
W74-09314

RECENT FEDERAL LEGISLATION SIGNIFICANT IN ENVIRONMENTAL PLANNING PROGRAMS OF THE STATE OF TEXAS.
Texas Law Inst. of Coastal and Marine Resources, Houston.
Available from the National Technical Information Service as COM-73-10617 $3.00 in paper copy, $1.45 in microfiche. February 1973. 19 p.

Descriptors: *Legislation, *Federal government, *Coasts, *Channels, Pollutants, Navigable waters, Oceans, Sea water, Federal Water Pollution Control Act, Water pollution, Water pollution control, *Texas, Ships, Water quality, Water quality standards, Structures, Structural design, Harbors.

Provisions are summarized and the effects described of the more important recently enacted federal statutes affecting Texas' environmental plans and programs. Some of the Acts alter existing law, others supersede state action, and several provide federal financial assistance for state and local programs. The purpose of the Ports and Waterways Safety Act of 1972 is to establish vessel traffic control systems in congested areas and to promote standards for vessels carrying materials which are potentially hazardous to the marine environment. The Federal Water Pollution Control Act of 1972 is intended to eliminate the discharge of all pollutants into the navigable waters of the United States by 1985 and to achieve an interim water quality suitable to protect fish, wildlife and water recreation. The purpose of the Marine Protection, Research, and Sanctuaries Act of 1972 is to regulate dumping of material which might adversely affect human health, and to provide for designation of marine sanctuaries. The Coastal Zone Management Act of 1972 is intended to provide federal grants on a co-operating basis with states for the development and administration of a coastal zone management program. (Sears-Florida)
W74-09316

SANITATION AND PUBLIC HEALTH PLANNING,
Escola Nacional de Saude Publica e de Medicina Tropical, Lisbon (Portugal).
For primary bibliographic entry see Field 5G.
W74-09317

A SUMMARY-DIGEST OF FEDERAL WATER LAWS AND PROGRAMS,
National Water Commission, Arlington, Va.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington, D.C. 20402 Price $1.75. J. L. De Weeidt and P. M. Glick, editors 1973. 205 p.

Descriptors: *Water resources development, *Water conservation, *Watershed management, Water quality control, *Flood plain zoning, Water, Water supply, Land development, Competing uses, Water yield improvement, Consumptive use, Recreation, Federal-state water right conflicts, Water pollution control, Water rights, Navigation.

Summaries are presented of water and water related programs and laws administered by the federal government. Such programs include related land use planning, research and data collection, navigation, maintenance of channels and other structural improvements, and watershed management. They also encompass structural measures to contain flood flows, land treatment measures to retard runoff, and disaster assistance. Also there are water supply programs to make water available for agricultural, industrial and domestic uses, as well as measures for conserving and increasing water supplies. Water quality, the prevention of pollution, management and development of fish resources, and recreation are still other aims of federal agencies and programs. This volume is a summary of the laws providing for all these programs as well as legal doctrines and their judicial development concerning navigability and navigable waters, apportionment of interstate water, and reserved water rights. (See also W74-06006) (Sperling-Florida)
W74-09318

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
For primary bibliographic entry see Field 2H.
W74-09350

ENVIRONMENT: A NEW FOCUS FOR LAND-USE PLANNING.
National Science Foundation, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09412

THE FUTURE OF THE URBAN HABITAT,
California Univ., Los Angeles.
J. Friedmann.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 57-82, October, 1973. 1 tab, 74 ref.

Descriptors: *Urbanization, *Suburban areas, *Environment, *Environmental control, *Governmental interrelations, Transportation, Population, Regional development, Resource management, Community development, Economies of scale, Social change, Social adjustment.
Identifiers: Suburbanization.

The constant increase in suburbanization, and the corresponding increase in size and decrease in density of the population surrounding the urban center has necessitated a new conceptual framework for metropolitan areas, i.e. urban field: a vast multicentered region having relatively low density, whose form evolves from a finely articulated network of social and economic linkages. The 100 odd urban fields existing today encompass 90% of the population and have areas as large as 9000-15,000 sq. miles. The expanse of the urban field due to the desire for individual space will necessitate the substitution of mobility for place in furnishing a large diversity of choice. Mass transportation systems will be incapable of delivering the mobility required to these sprawling, thinly populated areas. The automobile will maintain its traditional importance in society. The present trend toward formation of large Metrocenters to dispense goods and services will accelerate and such centers will comprise a complex economic network with the urban center. Because the fundamental social relationships are not as visible in the urban field as in the city, there has been a general decline in civic loyalty which has led to difficulties in governance especially when addressing problems of a regional scale. Solutions to the problems of governance include increased planning and control by the State governments, transformation of Councils of Governments into multipurpose regional governments, and a tiered hierarchy of multipurpose governments arranged according to a principle of territorial specialization. (See also W74-09412) (LaPointe-North Carolina)
W74-09413

LAND-USE INSTITUTIONS IN THE WASHINGTON-BALTIMORE REGION-A MIRROR FOR METROPOLITAN AMERICA,
Carnegie Institution of Washington, Washington, D.C.
E. A. Ackerman, R. G. Dyck, and A. E. Shidler.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 83-125, October, 1973. 9 fig, 3 tab, 57 ref.

Descriptors: *Land use, *Land development, *Governmental interrelations, Planning, Zoning, Environmental control, Transportation, Employment opportunities, Decision making, Jurisdiction, Water management, Urbanization, Public access, District of Columbia, Maryland.
Identifiers: *Washington(D.C.), *Baltimore(Md.), Unified planning, Metropolitan region.

The Washington-Baltimore metropolitan region is currently undergoing rapid growth. In the city of Washington, a variety of public planning bodies have been established over the years, but, by and large, the planning has been sporadic, piecemeal, and very unpredictable. Of two possible decision sequences, the balanced sequence, initially strong in public participation, has rarely been used because the key ingredients of comprehensive planning and public regulation of land use have only infrequently been employed in the metropolitan region. Land use regulation and management agencies in the Washington Metropolitan Area are fragmented into a myriad of multicounty, county and local commissions, each with particular responsibilities and activities. One conceptual model for the metropolitan area consists of four zones of development with different relationships among the responsible institutions in each. The recognition of the different characteristics of these zones, and the distinction between local decisions and county or zonal decisions allows for integrated or unified planning. Mobility, housing, environmental enhancement, and basic employment support are assessed to determine whether the present process of land development does attain certain social and economic objectives. Performance in all these areas have been substandard. To accomplish unified planning three alternatives are possible: (1) a continuation of current institutions with local additions and improvements, (2) a regional agency for Washington and one for Baltimore, (3) the assumption of greater powers for land development by the States of Maryland and Virginia. (See also W74-09412) (LaPointe-North Carolina)
W74-09414

LAND-USE RESEARCH ISSUES SUGGESTED BY A NATIONAL URBAN GROWTH STRATEGY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Urban Studies and Planning.
For primary bibliographic entry see Field 4A.
W74-09415

CONFLICTS IN LAND USE,
Ross, Hardie, O'Keefe, Babcock, McDugald and Parsons, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W74-09416

ECONOMIC POLICIES, ENVIRONMENTAL PROBLEMS, AND LAND USE,
California Univ., Riverside.
For primary bibliographic entry see Field 6B.
W74-09417

UNIVERSITY RESEARCH AND PRACTICE: AN INSTITUTIONAL CONFRONTATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
D. Dubbink, and I. Reiff.
In: Environment: A New Focus for Land Use Planning, National Science Foundation, Washington, D.C., Report NSF/RA/E-74-001, p 249-263, October 1973. 7 ref.

Descriptors: *Research, *Research priorities, *Institutions, *Universities, *Environment, Specializations, Communication, Grants, Management, Planning, Local governments.

Discussions with university researchers and practitioners in environmental management agencies have revealed minimal communication and some degree of animosity between the two groups. Presumption of eager university involvement in practical problem solving did not hold true. The university reward system places little value on pragmatic problems, while civil agencies often shun innovative ideas that would disturb organizational integrity. Value conflicts arise out of the university researchers' totally objective 'value-free' methodology. Ideal studies generate many difficulties when attempts are made to apply them to real world problems, making civil personnel wary of applying new technologies. Institutional differences also mediate against rapport between university and local government. Time frames differ from years for the researcher to days and weeks for the practitioner. The university publication ethic tends to view practitioner-related research as unproductive time with little value in tenure considerations. Civil agencies tend to stress durability and patience, not technological innovation. Solving environmental problems with appropriate academic specialists and government agencies can be a severe problem. In spite of the difficulties, however, more research must be directed to present practical needs. Recommendations proposed are: (1) funding agency should monitor independently the quality of cooperative research relationships to insure their authenticity; (2) community service skills should be criteria for academic advancement; (3) research should be of a deliberately iterative nature, giving the practitioner a reduced time span from problem definition to workable solutions; (4) nonuniversity research could be improved through federal support. (See also W74-09412) (LaPointe-North Carolina)
W74-09421

RURAL WATER SYSTEM DESIGNED FOR SUBURBAN USE,
For primary bibliographic entry see Field 5F.
W74-09519

UNIVERSITY STUDENTS IMPLEMENT PUBLIC POLICY RURAL COMMUNITY ACTION WITH A WATER DEVELOPMENT PROJECT,
Case Western Reserve Unit., Cleveland, Ohio. Urban and Environmental Studies.
For primary bibliographic entry see Field 5G.
W74-09557

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER QUALITY MANAGEMENT ON LAKE ERIE: YEAR TWO,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 5G.
W74-09653

WASTE MANAGEMENT RESEARCH.
For primary bibliographic entry see Field 5D.
W74-09663

AGRICULTURE IN THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-09664

IMPLICATIONS OF THE PERMIT PROGRAM IN THE POULTRY AND ANIMAL FEEDING INDUSTRY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5G.
W74-09667

APPLICATION OF IOWA'S WATER POLLUTION CONTROL LAW TO LIVESTOCK OPERATIONS,
Iowa State Dept. of Health, Des Moines.
For primary bibliographic entry see Field 5G.
W74-09668

A REVIEW OF PUBLIC AND PRIVATE LIVESTOCK WASTE REGULATIONS,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 5G.
W74-09669

IMPLICATIONS OF STATE ENVIRONMENTAL LEGISLATION ON LIVESTOCK WASTE MANAGEMENT,
Economic Research Service, Washington, D.C. Farm Production Economics Div.
For primary bibliographic entry see Field 5G.
W74-09670

POTENTIAL CITIZEN INITIATED LEGAL ACTION AGAINST AGRICULTURAL POLLUTION,
West Virginia Univ., Morgantown. Div. of Resource Management.
For primary bibliographic entry see Field 5G.
W74-09671

DAIRY FARMER CONCERNS OF LAWS AND REGULATIONS AFFECTING ANIMAL WASTE MANAGEMENT,
National Milk Producers Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-09672

OPERATIONAL PROBLEMS OF POULTRY PRODUCTION RELATED TO ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 5D.
W74-09689

MANAGING WATER RESOURCES: BASIC CONSIDERATIONS AND PROBLEMS,
San Francisco Water Dept., Calif.
For primary bibliographic entry see Field 6B.
W74-09734

AN INFORMATION SYSTEM FOR THE MANAGEMENT OF LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 2H.
W74-09752

STATE STANDARDS FOR MERCURY AND HEAVY METALS.
For primary bibliographic entry see Field 5G.
W74-09767

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: OHIO RIVER, BROOKE COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W74-09354

FLOOD PLAIN INFORMATION; POCOTALIGO RIVER-TURKEY CREEK-CANE SAVANNAH CREEK-GREEN SWAMP-SHOT POUCH CREEK-ROCK BLUFF SWAMP, SUMTER COUNTY, SOUTH CAROLINA.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-09355

FLOOD PLAIN INFORMATION; WILKESBORO AND NORTH WILKESBORO, NORTH CAROLINA; YADKIN RIVER AND REDDIES RIVER.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-09356

FLOOD PLAIN INFORMATION; KIT AND NORTHEAST CREEKS; RESEARCH TRIANGLE AREA, DURHAM AND WAKE COUNTIES, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-09357

FLOOD PLAIN INFORMATION; REEDY RIVER, RICHLAND CREEK, GREENVILLE COUNTY, SOUTH CAROLINA.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-09358

ECOLOGICAL RIVER BASIN MANAGEMENT,
National Parks and Conservation Association, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09559

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL STATEMENTS--ENGINEER REGULATIONS ON PREPARATION AND COORDINATION.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-09258

RAYSTOWN LAKE--RAYSTOWN BRANCH JUNIATA RIVER, PENNSYLVANIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 8D.
W74-09262

PROPOSED IRRIGATION DISTRIBUTION SYSTEM FOR POND-POSO IMPROVEMENT DISTRICT (PL 984), KERN COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Mid-Pacific Regional Office, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W74-09263

BEACH EROSION CONTROL STUDY ON MANATEE COUNTY, FLORIDA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W74-09264

APPLICATION OF SEWAGE SLUDGE TO AGRICULTURAL LAND IN MINNESOTA (FINAL ENVIRONMENTAL STATEMENT),
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-09265

LIBBY REREGULATING DAM AND LAKE--AT SITE POWER KOOTENAI RIVER, MONTANA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 8C.
W74-09266

MAINTENANCE OF THE NEWARK BAY, HACKENSACK AND PASSAIC RIVERS NAVIGATION PROJECT, NEW JERSEY (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York, N.Y.
For primary bibliographic entry see Field 4A.
W74-09267

EL DORADO LAKE, WALNUT RIVER, KANSAS, VOLUME 1, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W74-09268

NEW MELONES LAKE STANISLAUS RIVER, CALIFORNIA: SUPPLEMENTAL DATA ON USE OF CONSERVATION YIELD (SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W74-09269

PORT VERDIGRIS 33, INC., VERDIGRIS RIVER, OKLAHOMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W74-09270

BEAR CREEK PROJECT, TENNESSEE (FINAL ENVIRONMENTAL STATEMENT).
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 4A.
W74-09271

BUENA VISTA FLOOD PROTECTION PROJECT, BUENA VISTA, VIRGINIA (FINAL ENVIRONMENTAL STATEMENT),.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W74-09272

MAINTENANCE DREDGING AND JETTY REPAIR, HAMPTON HARBOR, NEW HAMPSHIRE (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W74-09273

MAINTENANCE DREDGING, CHATHAM (STAG E) HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W74-09274

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09278

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES (FINAL ENVIRONMENTAL STATEMENT).
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09279

MONTGOMERY V. ELLIS (ACTION SEEKING TO ENJOIN STREAM CHANNELIZATION).
For primary bibliographic entry see Field 6E.
W74-09299

TO AMEND THE WILD AND SCENIC RIVERS ACT.
For primary bibliographic entry see Field 6E.
W74-09308

PROPOSED WILD AND SCENIC CHATTOOGA RIVER AND THE CONVEYANCE OF CERTAIN PUBLIC LANDS.
For primary bibliographic entry see Field 6E.
W74-09310

ECOLOGICAL CONCEPTS AND APPLICATIONS TO PLANNING,
Michigan State Univ., East Lansing. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W74-09418

PLANNING FOR AREAS OF SIGNIFICANT ENVIRONMENTAL AND AMENITY VALUE,
California Univ., Berkeley. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6B.
W74-09420

THE ENVIRONMENTAL IMPACT CONCEPT, AND ITS EFFECT ON THE NATIONAL GAS INDUSTRY,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 5C.
W74-09489

ENVIRONMENTAL DISRUPTION: IMPLICATIONS FOR ECONOMIC PLANNING,
For primary bibliographic entry see Field 6B.
W74-09564

7. RESOURCES DATA

7B. Data Acquition

LASER RAMAN SPECTROSCOPY OF SOLUTES DISSOLVED IN WATER FROM A REMOTE PLATFORM,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-09255

SNOW SURVEY AND VEGETATION GROWTH IN HIGH MOUNTAINS (SWISS ALPS),
Zurich Univ. (Switzerland). Geographisches Institut.
For primary bibliographic entry see Field 2C.
W74-09320

SIMPLE METHOD OF MEASURING THE AVERAGE AMOUNT OF WATER PRODUCED ANNUALLY BY MELTING OF ICE ON A GLACIER,
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-09343

DISCHARGE COEFFICIENTS OF FLOAT-AREA-TYPE FLOW METERS,
Tokyo Science Univ. (Japan).
For primary bibliographic entry see Field 2E.
W74-09480

UNDERWATER TELEVISION - ITS DEVELOPMENT AND FUTURE,
Hydro Products, San Diego, Calif.
C. L. Strickland.
Underwater Journal Information Bulletin, Vol 5, No 6, p 244-249, December 1973. 9 fig.

Descriptors: *Remote sensing, *Photography, Cameras, *Instrumentation, Exploration, Telemetry.
Identifiers: *Underwater television.

The development and future of underwater television is reviewed. In the past ten years, underwater television systems have evolved from bulky, unreliable studio-type cameras mounted in watertight housings to miniature, highly portable units capable of extending man's vision into the most rugged environments. The reason for this evolution has been the development of cameras designed specifically for use underwater and their acceptance as useful tools for virtually any application where man must extend his visual capability in order to do useful work. This evolution process is continuing towards highly sophisticated underwater television systems designed for specialised work such as offshore drilling in deep water, underwater mining, sewer and pipeline inspection, ship-hull inspection and many others. (Campbell-NWWA)
W74-09545

APPLICATION OF ERTS-1 IMAGERY IN THE VERMONT-NEW YORK DISPUTE OVER POLLUTION OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Remote Sensing Lab.
For primary bibliographic entry see Field 5B.
W74-09585

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 5B.
W74-09602

CALIBRATION OF U.S. GEOLOGICAL SURVEY RAINFALL/RUNOFF MODEL FOR PEAK FLOW SYNTHESIS--NATURAL BASINS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W74-09603

A GENERAL PURPOSE EVENT WATER-LEVEL RECORDER,
National Water and Soil Conservation Organization, Wellington (New Zealand).
J. E. Patterson.
New Zealand Hydrological Research Progress Report No 14, 1973. 29 p, 18 fig, 2 ref.

Descriptors: *Data collections, *Water measurement, Hydrologic data, Stream gages, Equipment, Peak discharge.
Identifiers: *Event recorders.

A battery-operated water-level recorder developed for general purpose uses may be modified to record events. The recorder is a modified Fischer and Porter series 1542 analog-to-digital water-level recorder. The conversion is partly mechanical and partly electronic. The conversion kit comprises a sensor to detect stage changes, a set of components mounted behind the high-order code disc for producing time pulses and allowing alignment of the code disc with respect to the punches, a stepping motor and gearbox driving the high-order code disc, and an electronic circuit which controls the stepping motor and the punch motor in response to commands from the clock, the sensor and the time switches behind the high-order code disc. (Knapp-USGS)
W74-09604

SNOW SAMPLING TECHNIQUES ON A SMALL SUBALPINE WATERSHED,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W74-09608

A COMPARISON OF TECHNIQUES OF SAMPLING THE ARCTIC-SUBARCTIC SNOWPACK IN ALASKA,
Soil Conservation Service, Anchorage, Alaska.
For primary bibliographic entry see Field 2C.
W74-09609

A HYBRID AUTOMATIC ANALYSER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5A.
W74-09622

AN ADAPTED DETERMINATION OF PHOSPHATE IN SEAWATER FOR USE WITH THE HYBRID AUTOMATIC ANALYSER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5A.
W74-09623

ON THE PRESSURE CHAMBER TECHNIQUE FOR ESTIMATING LEAF WATER POTENTIAL IN SORGHUM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W74-09730

TELEMETERED PROFILING ISOTOPIC SNOW GAUGE: FINAL REPORT AND SPECIFICATIONS,
Aerojet Nuclear Co., Idaho Falls, Idaho.
For primary bibliographic entry see Field 2C.
W74-09757

7C. Evaluation, Processing and Publication

SNOW SURVEY AND VEGETATION GROWTH IN HIGH MOUNTAINS (SWISS ALPS),
Zurich Univ. (Switzerland). Geographisches Institut.
For primary bibliographic entry see Field 2C.
W74-09320

GROUND-WATER DATA, 1972, INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-09352

FLOOD PLAIN INFORMATION: OHIO RIVER, BROOKE COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W74-09354

FLOOD PLAIN INFORMATION; POCOTALIGO RIVER-TURKEY CREEK-CANE SAVANNAH CREEK-GREEN SWAMP-SHOT POUCH CREEK-ROCK BLUFF SWAMP, SUMTER COUNTY, SOUTH CAROLINA.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-09355

FLOOD PLAIN INFORMATION; WILKESBORO AND NORTH WILKESBORO, NORTH CAROLINA; YADKIN RIVER AND REDDIES RIVER.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-09356

FLOOD PLAIN INFORMATION; KIT AND NORTHEAST CREEKS; RESEARCH TRIANGLE AREA, DURHAM AND WAKE COUNTIES, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-09357

FLOOD PLAIN INFORMATION; REEDY RIVER, RICHLAND CREEK, GREENVILLE COUNTY, SOUTH CAROLINA.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-09358

CALCULATION OF NATURAL CATCHMENT INFILTRATION BY COMPUTER,
National Water and Soil Conservation Organization, Wellington (New Zealand).
A. W. Hurst.
New Zealand Hydrological Research Progress Report No 15, 1973. 24 p, 6 fig, append. Published by Ministry of Works, Wellington, New Zealand.

Descriptors: *Computer programs, *Rainfall-runoff relationships, *Infiltration, Base flow, Hydrograph analysis.
Identifiers: *New Zealand.

Computer programs which analyze rainfall and runoff records to calculate infiltration are described. The programs establish a standard method of calculating infiltration, so that measurements at different places and times can be reasonably compared. The system consists of three programs, which are run in sequence. DISPLAY gives a graphical representation of the rainfall and runoff. From this program the starting and finishing times of storms can be obtained for use in the next program. FLOWINF separates the surface flow from the base flow and interflow components. The program calculates total surface runoff for each storm and total rainfall over the storm period. From these figures, an initial estimate of infiltration rate (which is assumed to be constant for each storm) is made. The values are a first estimate. Unlikely values usually indicate errors in the rainfall or runoff, or a catchment in which the surface flow is not separable from the interflow. TIMECOND calculates an infiltration rate equation by an iterative method. The precipitation is corrected for interception loss, and infiltration, according to an assumed equation, is subtracted. The result is a predicted total surface runoff for each storm. The prediction is compared with the actual surface runoff found by program FLOWINF, and a new infiltration equation is calculated. This is done four times, and by the fourth step the predicted and actual runoff totals will be fairly close if the assumptions in program TIMECOND are justified. (Knapp-USGS)
W74-09367

RECORDING FLOODS AND FLOOD DAMAGE,
Geological Survey, Reston Va.
For primary bibliographic entry see Field 4A.
W74-09397

THE WORTH OF DATA IN HYDROLOGIC DESIGN,
Geological Survey, Washington, D.C.
M. E. Moss, and D. R. Dawdy.
Highway Research Record, No 479, p 46-53, 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Hydrologic data, *Cost-benefit analysis, *Data collections, *Flood data, Flood forecasting, Highways, Bridges, Roads, Design flood, Simulation analysis, Statistics, Probability, Statistical methods.

Current methodologies for the determination of the worth of hydrologic data are reviewed. The simulation approach requires information concerning the statistical properties of the data that are not usually known. The Bayesian approach often leads to mathematically intractable relations. The two approaches may be combined by defining the data worth through simulation under the condition of assumed statistical properties and releasing the conditioning by making use of the prior distributions of the unknown statistics obtained from the Bayesian approach. This combined approach circumvents the problems encountered when either the Bayesian or the simulation approach is used exclusively. An example illustrates the use of the combined approach in evaluation of the worth of flood data in the design of highway crossings. (See also W74-09390) (Knapp-USGS)
W74-09399

HYDROLOGIC DATA STORAGE AND RETRIEVAL SYSTEM,
Nevada Univ., Reno. Center for Water Resources Research.
H. N. Friesen.
Available from NTIS, Springfield, Va. 22151 as NVO-1253-2 Price $3.00 printed copy; $1.45 microfiche. User Information Bulletin 1, June 1972. 17 p, 6 fig, 3 tab. AEC Contract AT (29-2)-1253.

Descriptors: *Data storage and retrieval, *Hydrologic data, Data processing, *Information exchange, Statistical methods, *Data collection.

Hydrologic data collected from various Atomic Energy Commission test sites is stored and retrieved in a computerized system as an aid to geologic and hydraulic investigations. The system was designed with emphasis on ease of user retrieval. A diversified set of statistical routines is included in the system to provide the user with a wide choice of post-retrieval data manipulation. (Knapp-USGS)
W74-09401

AN OBJECTIVE WATER QUALITY INDEX,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5G.
W74-09436

CONTINUOUS SIMULATION MODELS IN URBAN HYDROLOGY,
Organization Stanford Univ., Calif.
For primary bibliographic entry see Field 3D.
W74-09479

COMPUTER DATA FLOWS SMOOTHLY FOR SMALL WATER AUTHORITY,
Monroeville Water Authority, Pa.
For primary bibliographic entry see Field 6C.
W74-09483

PITFALLS IN PARAMETER ESTIMATION FOR OXYGEN TRANSFER DATA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5A.
W74-09514

(WATER WELL CONTRACTOR SURVEY).
Water Supply Management, Barrington, Ill.
For primary bibliographic entry see Field 4B.
W74-09529

SIMULATION CRITERIA FOR SELECTING WATER RESOURCE SYSTEM ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 6A.
W74-09567

A GENERAL PURPOSE SIMULATION MODEL FOR ANALYSIS OF SURFACE WATER ALLOCATION USING LARGE TIME INCREMENTS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 6A.
W74-09568

AN OCEANOGRAPHIC OBSERVATION OF NEW YORK BIGHT FROM ERTS-1,
Atlantic Oceanographic and Meteorological Lab., Miami, Fla. Physical Oceanography Lab.
For primary bibliographic entry see Field 5B.
W74-09589

DESKTOP COMPUTER FLOW ROUTING,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 8B.
W74-09626

MULTIPLE LINEARIZATION FLOW ROUTING MODEL,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 8B.
W74-09627

GEOHYDROLOGY OF CROW CREEK AND LOWER BRULE INDIAN RESERVATIONS, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
L. W. Howells.
For sale by USGS, Washington, D.C. 20244 Price, $1.25 per set. Hydrologic Investigations Atlas HA-499, 1974. 1 sheet, 10 fig, 4 tab, 4 ref.

Descriptors: *Hydrogeology, *South Dakota, *Indian reservations, Missouri River, Water supply, Reservoirs, Water quality, Water yield, Aquifer, Groundwater.
Identifiers: Crow Creek Indian Reservation(So Dak), Lower Brule Indian Reservation(So Dak).

Shallow groundwater is not obtainable in much of the Crow Creek and Lower Brule Indian Reservations of South Dqkota, and where it is found, it often is of poor quality. Surface water, with the exception of the Missouri River reservoirs, though a valuable and widely distributed resource, is undependable because of scanty and erratic precipitation. Therefore, some people have drilled

deep artesian wells for their basic water needs. Because of the expense of drilling artesian wells, most people will continue to use surface water and shallow groundwater, as available, particularly for livestock supplies. The best chemical quality and largest volume supply of water available within the reservations is from the Missouri River reservoirs. However, financial cost of such development probably will restrict it to large projects or to individual users within a mile or so of the reservoirs; in general, the greater the distance from the reservoir, the higher the cost and the larger the area that probably should be developed. Surface runoff is widely developed for livestock supplies. Although evaporation losses are high, as much as 38 inches a year, dams and dugouts are a comparatively inexpensive way to hold snowmelt and storm runoff for later use at widely dispersed sites. Shallow ground water of fairly good quality is available in only a few areas. In most of these areas well yields will be less than 20 gpm, although two areas will support well yields greater than 50 gpm. (Knapp-USGS)
W74-09638

URBANIZED AREAS SERVED BY SEWERS AND SEPTIC TANKS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
G. G. Parker, Jr.
Basic Data Contribution No 4 (open-file report), 1974. 1 map, 10 ref.

Descriptors: *Septic tanks, *Maps, *Washington, Cities, Urbanization, Waste water disposal, Waste disposal, Sewers.
Identifiers: *Seattle(Wash), *Tacoma(Wash).

Data areas in Seattle and Tacoma, Washington served by sanitary sewerage systems are shown on a map. The approximate suburban areas where buildings are individually served by septic tanks are also shown. In the Seattle-Tacoma urban complex the largest single sewage-treatment system is that of Metro (Municipality of Metropolitan Seattle) which in 1971 processed almost 57 billion gallons of waste water from an estimated population of about 900,000. Another large sewage-treatment system is operated by the city of Tacoma which in 1971 processed about 18 billion gallons of waste water from an estimated population of about 200,000. More than half the treated waste water in the study area is discharged directly into Puget Sound through submarine outfalls. (Knapp-USGS)
W74-09639

PUBLIC WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
G. G. Parker, Jr.
Basic Data Contribution No 3 (open-file report), 1974. 1 map, 12 ref.

Descriptors: *Water utilization, *Water supply, *Cities, *Washington, Urbanization, Water works, Utilities, Water distribution(Applied).
Identifiers: Seattle(Wash), Tacoma(Wash).

Areas in Seattle and Tacoma, Washington which are served by public water-supply systems are shown on a map. In 1973 King County had 76 Class I (more than 100 services) water-supply systems, and at least 783 Class II (less than 100 services) systems. Pierce County had 41 Class I and 275 Class II water-supply systems, Snohomish County had 45 Class I and 182 Class II systems, and Thurston County had 11 Class I and 130 Class II systems. In 1970 about 1,720,000 people used water from public-supply systems within the study area. This was almost 94 percent of the total population in the study area. About 82 percent of the public water supplies in the study area came from streams and lakes rather than from springs and wells. The use of publicly supplied water in the study area was almost unchanged between 1965 and 1970, while such use in the State as a whole increased by about 8 percent. (Knapp-USGS)
W74-09640

COMPUTER MODELING APPLICATIONS IN URBAN WATER PLANNING,
Denver Board of Water Commissioners, Colo.
For primary bibliographic entry see Field 6A.
W74-09654

STOCHASTIC ANALYSIS OF ORTHOKINETIC FLOCCULATION,
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 5D.
W74-09719

ERTS-1 VIRGIN ISLANDS EXPERIMENT 589--DETERMINE BOUNDARIES OF ERTS AND AIRCRAFT DATA WITHIN WHICH USEFUL WATER QUALITY INFORMATION CAN BE OBTAINED,
Grumman Ecosystems Corp., Bethpage, N.Y.
For primary bibliographic entry see Field 5A.
W74-09756

8. ENGINEERING WORKS

8A. Structures

BEACH EROSION CONTROL STUDY ON MANATEE COUNTY, FLORIDA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W74-09264

MAINTENANCE OF THE NEWARK BAY, HACKENSACK AND PASSAIC RIVERS NAVIGATION PROJECT, NEW JERSEY (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York, N.Y.
For primary bibliographic entry see Field 4A.
W74-09267

EL DORADO LAKE, WALNUT RIVER, KANSAS, VOLUME 1, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W74-09268

NEW MELONES LAKE STANISLAUS RIVER, CALIFORNIA: SUPPLEMENTAL DATA ON USE OF CONSERVATION YIELD (SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W74-09269

PORT VERDIGRIS 33, INC., VERDIGRIS RIVER, OKLAHOMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W74-09270

BEAR CREEK PROJECT, TENNESSEE (FINAL ENVIRONMENTAL STATEMENT).
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 4A.
W74-09271

MAINTENANCE DREDGING AND JETTY REPAIR, HAMPTON HARBOR, NEW HAMPSHIRE (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W74-09273

MAINTENANCE DREDGING, CHATHAM (STAG E) HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W74-09274

SEISMIC PROFILES, COOPER RIVER.
For primary bibliographic entry see Field 2L.
W74-09388

HIGHWAYS AND THE CATASTROPHIC FLOODS OF 1972.
Highway Research Board, Washington, D.C.
For primary bibliographic entry see Field 2E.
W74-09390

DESIGN CRITERIA AND RESEARCH NEEDS,
Hydrologic Engineering Center, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-09400

THE EFFECT OF PROPOSED DEEPENING OF THE JOHN F. BALDWIN AND STOCKTON SHIP CHANNELS ON SALT-WATER INTRUSION, SUISUN BAY AND SACRAMENTO-SAN JOAQUIN DELTA AREAS, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W74-09408

FLOW SMOOTHING IN SANITARY SEWERS,
Environmental Protection Agency, Springfield, Ill.
For primary bibliographic entry see Field 5D.
W74-09471

DISCHARGE RELATIONS FOR SUBMERGED WEIRS,
R. S. Varshney, and S. K. Mohanty.
Indian Journal of Power, Vol 23, No 7, p 225-228, July, 1973. 3 fig, 9 ref.

Descriptors: Engineering structures, Hydraulics, *Weirs, *Overflow, Flow, Mathematical studies, *Mathematical models, *Floods, Municipal wastes.
Identifiers: *Submerged flow.

Mathematical formulae are presented for submerged flow over sharp-crested and broad-crested weirs during floods based on experimental studies. Dimensional analysis shows that the flow over a weir in submerged condition is mainly governed by three dimensional parameters: Froude Number, P/H1, and H2/H1. P stands for the height of weir from the river bed; H1 and H2 are depths of water over weir crest upstream and downstream, respectively. The effect of P/H1 can be eliminated by suitably choosing the ratio P/H1 such that the approach depth does not affect the coefficient of discharge. Thus it is the ratio H2/H1 which mainly governs the submerged flow phenomenon. A correlation between this ratio and the discharge ratio was used to establish the mathematical relationship. The different types of weirs were broadly divided into the sharp-crested and broad-crested weirs, and two mathematical relations were suggested for evaluating stream flow in practical cases. The simplifying assumptions made may involve slight errors, but these are of no major significance to the field engineers. Therefore, the equations can be adopted in practical cases. (Merritt-FIRL)
W74-09481

CHECKING THE SIZE OF SEWERAGE INFILTRATION AND LEAKS OCCURRING UNDER OPERATING CONDITIONS, (VERIFICAREA MARIMII INFILTRATIILOR SI EXFILTRATILOR DIN CANALIZARI IN TIMPUL EXPLOATARII),
For primary bibliographic entry see Field 5D.
W74-09493

BETTER STORM DRAINAGE FACILITIES--AT LOWER COST,
For primary bibliographic entry see Field 5D.
W74-09513

BEYOND 'CITY WATER': RURAL WATER SYSTEM DESIGN,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
For primary bibliographic entry see Field 6B.
W74-09538

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-09543

TWO TESTS FOR THE CLUSTER WELL CONCEPT,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
E. L. Cobb.
Water Well Journal, Vol 28, No 2, p 16-18, 23, February 1974. 2 fig, 1 tab.

Descriptors: *Wells, *Shallow wells, Water supply, Community development, Pipelines, Rural areas, Economics, *South Carolina, *Virginia.
Identifiers: *Cluster-well concept, Community water supply, Rural water supply.

The success of the cluster-well concept as developed by NDWP is tested in the Jasper County, South Carolina and Roanoke projects. Data show that high capacity wells developed to serve a larger number of sparsely distributed families is often uneconomical. In these areas, the distance between homes is often so great that the cost of pipe becomes the prohibiting factor. In such areas, the cluster-well concept of drilling and developing low capacity one- and two-family wells is often the most economical procedure. Although the cluster-well system is frequently less expensive than alternative methods, it is suggested that each project examine its own circumstances in detail, with cost being the chief factor under consideration. (Martino-NWWA)
W74-09549

FLOOD RUNOFF SYSTEMS WITH COLLECTOR CHANNEL AND FAST DISCHARGE FOR DAMS (VOLGYZAROGATAK GYUJTOCSATORNAS, SURRANTOS ARAPASZTOI),
G. Szakatsits.
Vizugyi Kozlemenyek, No 3, p 342-350, 1973.

Descriptors: Engineering structures, *Weirs, Dams, *Storm runoff, *Model studies, Channels, Channel improvement, Flood control.
Identifiers: *Collector channels.

Hydrologic, hydraulic, and engineering aspects of collector channels designed to collect, guide, and attenuate the runoff from runoff weirs to fast discharge facilities in dams were studied. Free overflow at maximum water yield, minimum possible dimensions of the collector channel, and hydraulically smooth, attenuated flow in the collector channel are the principal requirements of overflow-collector channel systems. Model studies of different configurations and designs of overflows, collector channels, and fast discharge facilities revealed the superiority of the conventional lateral overflow design to all other systems, and the positive economical and hydraulic advantages of trapezoid profiles for collector channels. The broadening of the collector channel does not give noteworthy additional advantages. Also, existing collector channels were found to be unnecessarily overdimensioned regarding channel depth. (Takacs-FIRL)
W74-09720

APPARATUS FOR RELEASING CHEMICALS CLEARING AND CLEANING WASTE PIPES,
For primary bibliographic entry see Field 5D.
W74-09725

INSTALLATION OF LARGE-DIAMETER FIBER-GLASS FLEXIBLE PIPE IN MUNICIPAL SYSTEMS,
Johns-Manville Corp., Denver, Colo.
R. M. Hutchison.
Journal of the American Water Works Association, Vol 65, No 12, p 791-793, December, 1973. 8 fig, 2 ref.

Descriptors: Engineering structures, Pipes, *Joints(Connections), *Linings, Municipal water.
Identifiers: *Fiber-glass pipes, Flexible pipes, Fillers, Gaskets.

Installation considerations for fiber-glass pipe are discussed with special emphasis on the value of proper installation and handling practices for flexible pipes. The soil surrounding the pipes must be capable of being compressed to a density of greater than or equal to 85 percent standard proctor, or be that dense in its natural state. A maximum 3/4 inch diameter crushed rock is ideal for backfill and bedding material. Installation can be evaluated by measuring the initial deflection with full load on the pipe. The anticipated ring deflection caused by axial bending, plus ring deflection induced by soil load, can be calculated. Initial deflection should not exceed 5.0 percent and long-term, full-load deflection should not exceed 7.5 percent. In municipal systems elastomeric gaskets (bell and spigot) are the preferable joint. Compression of the gasket should be present in the full offset opposition plus a minimum 5.0 percent initial deflection. Resin-rich inner surfaces with and without aggregate type fillers and thermoplastic liners are in use in pipes serving municipal markets. A major benefit to the utility is chemical and abrasion resistance. (Merritt-FIRL)
W74-09727

VACUUM SEWAGE CONVEYING WITH VACUUM OPERATED VALVE,
For primary bibliographic entry see Field 5D.
W74-09731

REALIZATION OF THE DANUBE FLOOD PROTECTION PROJECT FOR VIENNA (DAS WERDEN DES PROJEKTES FUER DEN DONAU-HOCHWASSERSCHUTZ VON WIEN),
For primary bibliographic entry see Field 4A.
W74-09739

8B. Hydraulics

WAVE ACTION AND BREAKWATER LOCATION HARBOR OF REFUGE FOR LIGHT-DRAFT VESSELS, BARCELONA, NEW YORK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Jackson, R. Y. Hudson, and J. G. Housley.
Available from the National Technical Information Service, Springfield Va. 22151 as AD-760 938. Technical Report No 2-523 September 1959. 42 p, 4 tab, 31 photo.

Descriptors: *Administrative agencies, *New York, *Harbors, *Model studies, *Breakwaters, Protection, Retaining walls, Public benefits, Structures, Hydraulic structures, Engineering structures, Ocean waves, Navigable waters, Federal government, Public access, Standards, Design, Design criteria, Waves, Turbulence, Flood waves.

A wave action and breakwater location harbor of refuge for light-draft vessels located in and around Barcelona, New York is contemplated. The tests were conducted through the construction of a hydraulic model, to determine whether the proposed breakwaters were adequate to protect the enclosed mooring basin from storm waves. If they were not adequate, a determination of the modifications necessary to provide protection at minimum cost was the next priority. It was concluded from the test results that a simple arrowhead-type breakwater system, similar to the one already proposed, will provide adequate protection from storm waves for all small craft properly anchored in a designated mooring area. Because of the arrowhead design the construction of the breakwater will not significantly affect the wave height or intensity at the harbor entrance. Logistics and specifications of the proposed breakwater system are included. (Silber-Florida)
W74-09259

OBSERVATIONS ON THE CAUSES OF BRIDGE DAMAGE IN PENNSYLVANIA AND NEW YORK DUE TO HURRICANE AGNES,
Federal Highway Administration, Washington, D.C. Office of Engineering and Traffic Operations.
For primary bibliographic entry see Field 2E.
W74-09396

THE WORTH OF DATA IN HYDROLOGIC DESIGN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-09399

DISCHARGE RELATIONS FOR SUBMERGED WEIRS,
For primary bibliographic entry see Field 8A.
W74-09481

EXPERIMENTAL FIELD STUDIES REQUIRED FOR THE DESIGN OF DRAINAGES, (STUDII EXPERIMENTALE IN TEREN, NECESARE PROIECTARII DRENAJELOR),
For primary bibliographic entry see Field 4A.
W74-09495

OPERATION AND MAINTENANCE OF WELLS,
Stamm-Scheele, Inc., Rayne, La.
For primary bibliographic entry see Field 8G.
W74-09524

WATER WELL DESIGN FOR EARTHQUAKE-INDUCED MOTIONS,
Bechtel Power Corp., Los Angeles, Calif.
H. N. Nazarian.
Journal of the Power Division, American Society of Civil Engineers, Vol 99, No P02, p 377-393, November 1973. 7 fig, 3 tab, 12 ref, 2 append.

Descriptors: Wells, *Water wells, *Seismic design, *Design, Engineering structures, Structural analysis, Soil dynamics, *Earthquakes, Seismic waves, *Stress.
Identifiers: Free-field deformation(Soil), Shear modulus, Modulus of elasticity, Safe shutdown earthquake.

A practical method of analysis for the seismic design of water wells is presented. The computational steps required for the casing analysis are based mainly on the effects of the free-field soil deformations due to seismic waves. Since maximum compressional and shear waves do not occur

simultaneously, results based on this method will mostly indicate an upper-bound stress condition. However, the method, with its shortcomings, will provide a simplified solution to an otherwise complex problem. By further refinements of the input parameters, it is possible to reduce the stress levels appreciably. Further research may be conducted in: (1) The areas of soil deformation above bedrock; (2) Phasing of waves with different wavelengths and incidence angles; (3) Definition of critical wavelength; and (4) Improved prediction of future earthquakes for a particular site. Although the discharge system is analyzed by dynamic theories, the resultant unusual mode shapes, effects of submerged portions, and maintenance requirements make the analysis a unique dynamics problem. (Campbell-NWWA)
W74-09535

AN EXPERIMENTAL STUDY OF DRAINAGE BASIN EVOLUTION AND THE INFLUENCE OF LANDFORMS ON HYDROLOGIC VARIABLES,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-09586

INFLUENCE OF SUCTION AND BLOWING ON ENTRAINMENT OF SAND PARTICLES,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2J.
W74-09616

STOCHASTIC ANALYSIS OF DUNE BED PROFILES,
Harza Engineering Co., Chicago, Ill. Water Resources Planning Div.
For primary bibliographic entry see Field 2J.
W74-09619

COMPARISON OF FOUR NUMERICAL METHODS FOR FLOOD ROUTING,
Hydraulics Research Station, Wallingford, (England).
For primary bibliographic entry see Field 2E.
W74-09621

DESKTOP COMPUTER FLOW ROUTING,
Geological Survey, Bay St. Louis, Miss.
T. N. Keefer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10669, p1047-1058, July 1974. 8 fig, 4 ref, 2 append.

Descriptors: *Routing, *Flood routing, Open channel flow, Mathematical studies, Systems analysis, Flood waves, Digital computers, Computer programs.

Flood routing by a minimum storage convolution scheme is presented so that the diffusion analogy or Harley routing models may be applied with desktop computers. The technique reduces the required storage for matrix convolution to 2n, in which n is the number of response function ordinates. An extension of the technique may be used for multiple linearization routing. (Knapp-USGS)
W74-09626

MULTIPLE LINEARIZATION FLOW ROUTING MODEL,
Geological Survey, Bay St. Louis, Miss.
T. N. Keefer, and R. S. McQuivey.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10668, p 1031-1046, July 1974. 12 fig, 2 tab, 12 ref, 2 append.

Descriptors: *Routing, *Flood routing, Open channel flow, Mathematical studies, Systems analysis, Flood waves, Digital computers, Computer programs.
Identifiers: Multiple linearization.

For flow routing, multiple linearization is a convolution technique which allows variations in wave celerity and damping with discharge. By treating the input to a routing reach as a set of inputs to several subsystems, rather than as a single system, from 10%-50% gains in root mean square accuracy can be obtained when routing hourly discharge values. Significant visual improvement in the arrival time of low flows is achieved. Little gain in accuracy is possible when routing daily discharges unless 2 day or 3 day differences in arrival time occur. (Knapp-USGS)
W74-09627

SIMULATION ACCURACIES OF GRADUALLY VARIED FLOW,
Montreal Engineering Co. Co. Ltd. (Quebec).
J. P. Jolly, and V. Yevjevich.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY7, Paper 10677, p 1011-1030, July 1974. 14 fig, 2 tab, 12 ref, 2 append.

Descriptors: *Simulation analysis, *Numerical analysis, *Gradually varied flow, Open channel flow, Mathematical models, Hydraulic models, Unsteady flow.

Two types of errors which occur in the numerical simulation of gradually varied, unsteady open-channel flows are errors resulting from the choice of the momentum equation and errors resulting from the degree of numerical sophistication of integration techniques used in solving the governing equations by the specified intervals scheme of the method of characteristics. Three different momentum equations cited in the literature give identical results when the velocity distribution is uniform. When this distribution is not uniform, each equation gives somewhat different flow depths for similar initial and boundary conditions of gradually varied, unsteady flow. An increase in complexity of the integration technique increases the accuracy of simulation. To determine the absolute values of accuracy of a technique, accurate flow measuring devices and corresponding experiments are needed for comparison between the results of numerical and physical simulations. (Knapp-USGS)
W74-09628

OPTIMAL DESIGN FOR HIGHWAY DRAINAGE CULVERTS,
Meta Systems, Inc., Springfield, Va.
For primary bibliographic entry see Field 4A.
W74-09630

VARIATION IN WIDTH-DISCHARGE RELATION AND SOME IMPLICATIONS FOR HYDRAULIC GEOMETRY,
Sheffield Univ. (England). Dept. of Geography.
D. Knighton.
Geological Society of America Bulletin, Vol 85, No 7, p 1069-1076, July 1974. 6 fig, 3 tab, 18 ref.

Descriptors: *Sediment transport, *Braiding, *Meanders, *Channel morphology, Geomorphology, Scour, Channel erosion, Bank erosion, Regime.

The downstream change in width in a channel with cohesive banks and no marked downstream variation in bank erodibility is principally a function of discharge, while rate of change at a cross section is largely controlled by bank material composition, particularly silt-clay content. Hydraulic geometry is thereby constrained. The deposition of noncohesive sediment in the form of point bars and central islands provides the means whereby the stream can increase its rate of change of width at a cross section, suggesting that meandering and braided reaches can be distinguished from straight reaches in terms of hydraulics. The effect of this adjustment is to decrease the mean velocity range. (Knapp-USGS)
W74-09632

OPTIMAL CONTROL OF FLOW IN COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-09652

HYDRAULICS OF A WATER SUPPLY SYSTEM WITH FLUCTUATING WATER DEMAND, (HYDRAULIK EINES WASSERVERSORGUNGSSYSTEMS MIT FLUKTUIERENDEN BEDARFSMENGEN),
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
R. G. Cembrowicz.
Angewandte Informatik, No 11, p 481-488, 1973. 8 ref. (English summary).

Descriptors: *Algorithms, Mathematical studies, *Model studies, *Systems analysis, Sewer systems, Engineering structures, Pipes, Water supply, *Water demand.

An algorithm has been developed using systems analysis techniques for the hydraulic dimensioning of a water supply system with counterpressure tank for fluctuating water demand. The pump characteristics and the water-level fluctuations in the tanks are taken into account in the model. The dimensions of the system components are given by the hydraulic equilibrium conditions as a function of parameters defined as pressure heads and pressure differences. The reference pressure of the pump stand, and the pressure head occurring at the feed-in point of the municipal network in the main pipe during the peak demand interval were found to be sensitive principal parameters of the water supply in sensitivity tests of the system for different fluctuations in the water demand. The hydraulic equilibrium in the tanks can be fully restored by adequate reduction of the pressure head during drops in the water demand. (Takacs-FIRL)
W74-09726

ENGINEERING AND CONSTRUCTION PRACTICES FOR GRAY AND DUCTILE CAST-IRON PIPE,
Cast Iron Pipe Research Association, Oak Brook, Ill.
W. H. Smith.
Journal of the American Water Works Association, Vol 65, No 12, p 788-791, December, 1973. 2 fig, 2 ref.

Descriptors: Engineering structures, Pipes, *Water hammer, *Casings, *Metal pipes, Corrosion.
Identifiers: *Cast iron pipes, Superloads, *Joints(Connections).

Gray cast iron pipe and ductile cast iron pipe were designed using realistic assumptions for earth load, trench support, superloads, impact internal pressure, and water hammer or surge. A wide range of joints is available for both pipe materials, from flanged joints, which are ideal for plant and pump station installations, to standard mechanical and push-on joints, which are reliable in allowing reasonable deflections, and subaqueous pipe joints, which allow for extreme deflection. Restrained joints resist thrust due to internal pressure. Corrosion resistance of ductile cast iron pipe is somewhat better than that of gray cast iron pipe, and only a small percentage of the soils in the United States is corrosive to either. Proven, inexpensive corrosion prevention can be accomplished

in any severely corrosive soils using loose polyethylene encasement. (Merritt-FIRL)
W74-09728

SOME LESSONS FROM MODEL AND FULL-SCALE TESTS IN RECTANGULAR SEDIMENTATION TANKS,
Imperial Chemical Industries Ltd., Runcorn (England). Mond Div.
For primary bibliographic entry see Field 5D.
W74-09736

8C. Hydraulic Machinery

LIBBY REREGULATING DAM AND LAKE--AT SITE POWER KOOTENAI RIVER, MONTANA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va., 22151, as EIS-MT-73-1228-F, $5.25 in paper copy. July 12, 1973. 64 p, 5 map.

Descriptors: *Dams, *Electric power production, *Project planning, *Power system operation, *Environmental effects, Spillways, Dam construction, Transmission(Electrical), *Montana, Cost-benefit ratio, Electric power demand, Federal government, Excavation, Backfill, Road construction.
Identifiers: *Environmental Impact Statements.

Discussed are the effects of adding at-site power generating facilities to the reregulating dam on the Kootenai River, Montana. The reregulating dam was authorized as part of the main Libby Dam project and as at-site generation was not included with the initial Congressional authorization, seperate authorization is required. At-site power would consist of four units capable of producing 30,600 kilowatts of firm power. The incremental benefit-to-cost ratio is 1.8 to 1. The addition of on-site power would have no effect on relocations beyond that already required for construction of the reregulating dam, except for the construction of an additional access road of approximately 1,000 feet. The excavation for this construction would result in less fill needed for the dam and might provide a beneficial effect by reducing the use of the spillway thereby decreasing the occurrence of nitrogen supersaturation downstream of the project. The only possible adverse effects might result from the transmission facilities that must be built to provide integration from the dam to the Bonneville Power Administration's system and will depend on the method of integration selected. The only alternative would be having no power generating facilities. (Sutton-Florida)
W74-09266

ALUMINUM PIT DOORS PROVIDE EASY ACCESS TO A RETENTION BASIN.
For primary bibliographic entry see Field 5D.
W74-09515

'PIG' BRINGS BACK CAPACITY,
Denver Water Dept., Colo.
H. H. Glasson.
Water Wastes Engineering, Vol 10, No 11, p 33-35, November, 1973.

Descriptors: *Colorado, Reservoirs, *Conduits, *Maintenance, Clays, Colloids, *Water supply, Water treatment.
Identifiers: *Denver(Colo), Ralston Reservoir(Colo), *Cleaning.

Two raw water conduits supplying Denver's water supply were cleaned using a device called a pig and designed by the utility's maintenance personnel. Ralston Reservoir has a storage capacity of 11,252 acre-ft and supplies raw water and through two cylinder-type reinforced concrete pipelines to the treatment plant. There was a substantial buildup of colloidal clay on the inner surface of the pipe, ranging in thickness from approximately 1/16th to 3/8th inch through most of the 8.7 miles. A two section, eight-bladed mechanical cleaner was designed and coupled to the plug or pig type cleaner like a trailer. A flexible coupling designed to allow for flexibility through the bends in the conduit attached this assembly to the pig. Operational capacity after cleaning increased from less than 52 mgd to over 67 mgd. New operational criteria based on reevaluation of design capabilities were established. (Merritt-FIRL)
W74-09516

HOW TRIPLE SIPHON SOLVED SEWAGE TRANSFER ACROSS WELLAND RIVER,
For primary bibliographic entry see Field 5D.
W74-09517

O AND M COSTS: PAY NOW OR PAY LATER,
National Water Well Association, Houston, Tex. Research Facility.
For primary bibliographic entry see Field 4B.
W74-09533

CHURCHILL FALLS--THE COSTS AND BENEFITS OF A HYDRO-ELECTRIC DEVELOPMENT PROJECT,
Macquarie Univ., North Ryde (Australia).
For primary bibliographic entry see Field 6B.
W74-09562

LINER INSERTING MACHINE FOR PIPELINES,
R. R. Reed.
U.S. Patent 3,774,286. Official Gazette of the United States Patent Office, Vol 916, No 4, p 1229, November 27, 1973.

Descriptors: Sewers, *Pipes, *Linings, Irrigation, *Patents, Equipment.
Identifiers: *Liner-inserting machine, Apparatus.

A liner-inserting machine for underground pipelines used in irrigation or sewer systems is described. Liner pipe sections are thrust into the pipeline by the patented machine. The machine includes a frame in an excavation adjacent to the open end of the pipeline. The frame supports a power actuated, reciprocable pusher head in axial alignment with the open end of the pipe. It forcefully thrusts the liner pipe sections in end-coupled relation into the existing pipeline. (Merritt-FIRL)
W74-09722

PRIMING UNIT FOR DISTRIBUTING PRIMING WATER TO MULTIPLE SEWER LINE WATER TRAPS,
Precision Plumbing Products, Inc., Portland, Oreg. (Assignee).
For primary bibliographic entry see Field 5D.
W74-09732

DELAYS IN THE OPERATION OF SUBSURFACE DRAINAGE TRENCHING MACHINES,
Quebec Ministere de l'Agriculture et de la Colonisation, Buckingham.
S. D. Fisk, R. S. Broughton, and E. R. Norris.
Canadian Agricultural Engineering, Vol 14, No 2, p 69-71, December, 1972. 1 fig, 2 tab, 3 ref.

Descriptors: *Drainage, *Trenches, *Construction, Subsurface drainage, Tile drainage, Installation, Drainage systems, Drainage engineering.

Observations of four, wheel-type, subsurface drainage trenching machines showed that delays accounted for 53.3-65.9 percent of total working-day time. The delays that appear to be most easily reduced include setting targets (5.7 percent time loss), making junctions (3.8 percent time loss), and moving to new job sites (3.7 percent time loss). Based on 174 available working days, the average effective digging time was an equivalent of only 72 days. By decreasing these time losses, the operational efficiency of subdrainage trenching can be improved and considerable savings can be made. (Skogerboe-Colorado State)
W74-09794

8D. Soil Mechanics

RAYSTOWN LAKE--RAYSTOWN BRANCH JUNIATA RIVER, PENNSYLVANIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Baltimore, Md.
Available from the National Technical Information Service, Springfield, Va. 22151 as EIS-PA-73-1293-F, $9.25 in paper copy. March 1973. 81 p, 19 tab, 4 fig, 15 photo, 18 append.

Descriptors: *Water resources development, *Water resources, *River basins, *Flood protection, *Flood control, Dams, Spillways, Environmental effects, *Pennsylvania, Inter-agency cooperation, Decision making, Federal project policy, Project purposes, Project planning, Recreation.
Identifiers: *Environmental Impact Statements, Huntingdon Co.(Pa.), *Raystown Lake (Pa.).

A flood protection project includes construction of a rock and earthfill dam, a dike, service bridges, concrete spillways, housing facilities, access roads, and recreation facilities. Purposes of the project are flood control, fish and wildlife preservation and recreational benefits. Land utilization downstream will be increased through construction of dams. Controlled discharges should result in improved fishing and recreational diversity will be greatly increased. The economy of the whole area surrounding the project should be enhanced and the lands will be protected and preserved consistent with both aesthetic and biological values. Adverse environmental effects will include relocating about 1,320 residences and an initial loss in the tax base of Huntingdon County. The recreation pool will permanently inundate 8,300 acres of land eliminating the habitat for all associated terrestrial biota, along with certain stream dwelling aquatic biota. Periodically, the flood pool will inundate an additional 2,500 acres which will adversely affect the biota in the flooded areas. Alternatives included other sites alone and in conjunction with local flood protection measures, dams with provisions for hydroelectric power, flood plain zoning, flood insurance, evacuation and total abandonment. (Sutton-Florida)
W74-09262

BUENA VISTA FLOOD PROTECTION PROJECT, BUENA VISTA, VIRGINIA (FINAL ENVIRONMENTAL STATEMENT),.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W74-09272

DEPTH PREDICTION FOR EARTH-PENETRATING PROJECTILES,
Sandia Labs., Albuquerque, N. Mex. Terradynamics Div.
C. W. Young.
Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, p 803-817, May 1969. 2 fig, 3 tab, 7 ref, 4 append.

Descriptors: *Penetration, *Soil mechanics, Depth, Rock mechanics, Forecasting.
Identifiers: *Projectiles, *Depth prediction, Impact.

An empirical equation is developed for the prediction of total penetration distance of a projectile in many natural earth targets. Development of this

equation was based on approximately 160 full-scale penetration tests into a variety of targets, including rock, gypsite, permafrost, ice, desert alluvium, silt, sand, and saturated clay. The parameters considered in the development (other than target materials) were (1) projectile weights from 222 to 5,750 lb., (2) projectile diameters from 3.1 to 18 in., (3) impact velocities from 78 to 1,077 fps, and (4) 11 projectile nose shapes. The equation fits 91% of the data within 20% and fits 98.5% of the data within 25%. The necessary tables of nose-performance coefficients and soil constants are presented for practical engineering usage. (Staplin-NWWA)
W74-09534

8E. Rock Mechanics and Geology

FATIGUE BEHAVIOR OF ROCK,
Durham Univ. N.C.
P. B. Attewell, and I. W. Farmer.
International Journal of Rock Mechanics and Mining Science, Vol 10, No 1, January, 1973, p 1-9.

Descriptors: *Fatigue(Mechanics), *Failure(Mechanics), *Rock mechanics, Structural behavior, Cracks, Stress, Strain, *Dolomite.
Identifiers: Strain energy-dependent crack propogation.

The mechanism of fatigue in rocks has never been satisfactorily described. Results are reported of a number of fatigue tests on dolomite specimens, and a hypothesis is proposed to explain the resultant deformation based on a description of rock failure in terms of strain energy-dependent crack propagation. The basic argument is that above a stress level at which cracks are initiated, deformation from successive subfailure load cycles will be cumulative, and failure will occur when the strain energy stored in the specimen exceeds a critical energy level equivalent to failure under noncyclic loading. (Martino-NWWA)
W74-09523

A CENTRIFUGAL TECHNIQUE FOR RAPIDLY ESTIMATING THE PERMEABILITY OF A CONSOLIDATED SANDSTONE,
Birmingham Univ. (England). Dept. of Geology and Geophysics.
P. F. Worthington, and R. D. Barker.
Geotechnique, Vol 22, No 3, September, 1972. p 521-525.

Descriptors: *Sandstones, *Permeability, Porosity, Seismic properties, Electrical resistivity, *Centrifugation.
Identifiers: *Bunter sandstones, Intergranular permeability, Total porosity, Seismic velocity, *United Kingdom.

Geophysical investigations of the Bunter Sandstone in the Fylde area of Lancashire are being undertaken by the subdepartment of geophysics at Birmingham University. An extensive field program is supported by laboratory measurements of total porosity, intergranular permeability, seismic velocity, and electric resistivity, with the object of establishing empirical relationships between these parameters. The determination of intergranular permeability using standard techniques has proved to be by far the most time-consuming of these studies. An alternative centrifugal technique essentially depends upon the extraction of water from a saturated sandstone sample when it is subjected to a centrifugal force for a given period of time. The method described can be used to estimate, to well within an order of magnitude, the intergranular permeability of up to 300 sandstone specimens per week. (Staplin-NWWA)
W74-09527

DEPTH PREDICTION FOR EARTH-PENETRATING PROJECTILES,
Sandia Labs., Albuquerque, N. Mex. Terradynamics Div.
For primary bibliographic entry see Field 8D.
W74-09534

8F. Concrete

HARDENED PORTLAND CEMENT PASTES OF LOW POROSITY, PART 5: COMPRESSIVE STRENGTH,
Clarkson Coll. of Technology, Potsdam, N.Y.
M. Yudenfreund, K. M. Hanna, J. Skalny, and I. Odler.
Cement Concrete Research, Vol 2, No 6, p 731-743, November, 1972. 11 fig, 9 ref.

Descriptors: *Porosity, *Cement, *Concrete, Temperature, Hydration, *Compressive strength, *Pores.
Identifiers: Type I clinker, Type II clinker, *Low-porosity pastes, Pore volume, Total porosity, Degree of hydration.

The compressive strengths of low-porosity pastes made from a Type I and a Type II clinker were investigated. Besides the effect of the type of cement, the effects of different grinding aids, surface of the cement, water-cement ratio (0.2 and 0.3), temperature of hydration (5 C, 25 C, and 50C), and the age of the paste on compressive strength were determined. The strength results correlated well with degree of hydration and total porosity, but there was definite indication of at least one other factor. The distribution of pore volume in pores of different sizes is suggested as a third factor influencing compressive strength. (Campbell-NWWA)
W74-09522

8G. Materials

OPERATION AND MAINTENANCE OF WELLS,
Stamm-Scheele, Inc., Rayne, La.
W. Arceneaux.
Journal American Water Works Association, Vol 66, No 3, p 199-204, March, 1974. 1 tab.

Descriptors: *Corrosion, Groundwater, *Wells, Chemical degradation, Chemical properties, Fouling, Scaling, *Corrosion control, Operation and maintenance.
Identifiers: *Incrustation, Acid treatment, Polyphosphate treatment.

Incrustation and corrosion are common problems encountered in wells. Several chemical means of reducing and removing incrustation and corrosion are discussed: acid treatment; chlorine treatment, polyphosphate treatment. Effectivenss of the above methods is greatly enhanced by vigorous agitation. The need for proper maintenance and record keeping is stressed. Methods of agitation and material relating to well screen design are presented. Finally, criteria are given for selection of the proper pump for a well. (Campbell-NWWA)
W74-09524

FUNDAMENTALS OF CATHODIC PROTECTION,
Harco Corp., Cleveland, Ohio. Cathodic Protection Div.
B. Husock.
Presented at AIEE Joint Southwest and Mid-America District Meeting, April 30-May 2, 1962, St. Louis, Missouri. 7 p, 7 fig, 7 ref.

Descriptors: *Corrosion, *Cathodic protection, *Corrosion control, Anodes, Cathodes, Electric currents, Chemical reactions, Oxidation, *Electrolytes.
Identifiers: Galvanic corrosion, Electrolytic corrosion, Stray currents.

Cathodic protection is an electrical method of preventing corrosion. It is used on metallic structures which are in electrolytes such as soil or water. It has had widespread application on underground pipelines, and has been found to be effective on numerous other underground and underwater structures such as lead cables, water storage tanks, lock gates and dams, steel pilings, well casings, ship hulls and interiors, water treatment equipment, trash racks and screens, etc. Methods of application are described. (Staplin-NWWA)
W74-09548

APPARATUS FOR RELEASING CHEMICALS CLEARING AND CLEANING WASTE PIPES,
For primary bibliographic entry see Field 5D.
W74-09725

INSTALLATION OF LARGE-DIAMETER FIBER-GLASS FLEXIBLE PIPE IN MUNICIPAL SYSTEMS,
Johns-Manville Corp., Denver, Colo.
For primary bibliographic entry see Field 8A.
W74-09727

ENGINEERING AND CONSTRUCTION PRACTICES FOR GRAY AND DUCTILE CAST-IRON PIPE,
Cast Iron Pipe Research Association, Oak Brook, Ill.
For primary bibliographic entry see Field 8B.
W74-09728

8I. Fisheries Engineering

FISH REARING IN THE RICE FIELDS OF THE VOLGA DELTA, (IN RUSSIAN).,
V. P. Ivanov, and N. I. Astapova.
Tr Kasp Nauch No-Issled Inst Rybn Khoz. 26 p241-244. 1971.
Identifiers: Deltas, Fish rearing, Rice fields, *USSR(Volga delta), *Crop rearing.

Rearing of carp fingerlings obtained as a result of the spawning of brood stock in drainage canals proved to be most effective. At a stocking density of 1 nest of spawners per hectare of drainage area and adjacent basins, fish productivity was 3.5 centners/ha. The average weight of the fingerlings was 75.8 g and the calculated profit is 300-400 rubles/ha. An analysis of other variants of the experiment is given.--Copyright 1974, Biological Abstracts, Inc.
W74-09284

FEEDING AND GROWTH OF YOUNG BREAM AT SPAWNING AND REARING FARMS OF THE VOLGA DELTA UNDER STREAM-FLOW CONTROL CONDITIONS, (IN RUSSIAN),
O. N. Vasil' Chenko.
Tr Kasp Nauch No-Issled Inst Rybn Khoz. 26 p, 192-198. 1971.
Identifiers: Abramis-Brama, *Bream, Crustaceans, Deltas, Growth rates, Plankton, *Spawning, *USSR(Volga delta), *Fish diets, *Fish rearing, Fish hatcheries.

Results are presented of a study of the changes in feeding habits and growth of young bream (Abramis brama) at all developmental stages in the spawning and rearing farms of the Volga delta (USSR) after its stream-flow control. The qualitative composition of the food of young bream in 1967-1968 was practically the same as in 1940-1952. At larval stages, the bream consumed planktonic and at juvenile stages planktonic and periphytonic organisms. The maximum intensity of feeding was noted in mid-May, when the biomass of planktonic crustaceans in bodies of water reached a maximum. The rate of growth of the young bream at early developmental stages did

not undergo substantial changes in accordance with the feeding habits. At juvenile stages, the growth rate of the young bream dropped almost by half, which indicates the need to use intensification measures at the spawning-rearing farms to improve the food base of the bodies of water.--Copyright 1974, Biological Abstracts, Inc.
W74-09313

THE EFFECTS OF LAND USE ON SALMON PRODUCTION,
Alaska State Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 4C.
W74-09411

ARTIFICIAL FEEDING OF CARP FRY,
A. E. Iman, and A. P. Habashy.
Bul Inst Oceanogr Fish. 2: p 261-274. 1972.
Identifiers: *Artificial feeding, Carbohydrates, *Carp fry, *Growth rates, Minerals, Protein, Vitamins.

Selection was made of the most effective and economic artificial diet for the production of healthy carp fry in a short period. During the first week, carp fry depend completely upon natural food, after which, artificial food can be introduced as a supplementary diet to balance the natural one and to enhance growth rate. Artificial food which gave the highest growth rate contained a protein level of about 35%, a carbohydrate level of about 49% and also vitamins and mineral salts. The rate of stocking of fry/m2 is an important factor. The most suitable rate of stocking of carp fry was 10 fry/m2. If the nursery ponds are prepared to furnish a good supply of natural food and the proper rate of stocking, together with a suitable artificial diet, the desired number of healthy carp fry in a certain period can be obtained.--Copyright 1974, Biological Abstracts, Inc.
W74-09501

THE COMMERCIAL FEASIBILITY OF REARING POMPANO, TRACHINOTUS CAROLINUS (LINNAEUS), IN CAGES,
Miami Univ., Fl. Sea Grant Program.
T. I. J. Smith.
Available from the National Technical Information Service as COM-73-10771, $3.00 in paper copy, $1.45 in microfiche. Sea Grant Technical Bulletin No 26, January 1973. 6 fig, 13 tab, 65 ref. NOAA 2-35147.

Descriptors: *Aquiculture, *Commercial fish, *Marine fish, Fish farming, Growth rates, Florida, Cooling water, Thermophilic animals, Economics, Fish diets, Feasibility studies.
Identifiers: *Pompano, Cages.

The Florida pompano yields the highest retail price among commercial fish sold in the southern United States. Aquaculture of pompano using 6.4 mm mesh in 1-cu m aluminum cages, under stocking densities of 100, 250, 400, 650 and 900 was investigated near to Biscayne Bay, Florida. Water temperatures were stabilized as a result of thermal effluent from a nearby power plant. Results suggest that a marketable fish may be produced in 47-51 weeks. While the final growth and yield per fish were highest for low density cages, greatest total yield was obtained from high density cages. Mortality and food conversion levels were also examined with no significant differences among densities found. Half of overall mortality (21%) was due to dietary inadequacy. Fouling represented the major difficulty although some body abrasions might also be attributed to the cages. No significant disease or parasite problems were found. Feed costs to raise 1 kg of pompano vary from $1.70 (100 density) to $2.17 (900 density) with cage and labor cost for all distributed for 10 months at $2.79 and $31.25, respectively. Highest profits ($160) are generated from the 900 stocking density. Cage conditioning indicates that released pompano will remain in the area allowing cultivation without confining structures. (Schroeder-Wisconsin)
W74-09566

AN INITIAL EVALUATION OF ETHYLENE OXIDE FOR THE STERILIZATION OF FORMULATED AND PELLETED FISH FEEDS,
Victoria Univ. (British Columbia). Dept. of Bacteriology and Biochemistry.
For primary bibliographic entry see Field 2I.
W74-09723

AN INVESTIGATION INTO AGE AND LENGTH/MASS RELATIONSHIP OF TILAPIA MOSSAMBICA PETERS (PISCES: CHICHLIDAE) IN THE LOSKOP DAM RESERVOIR, EASTERN TRANSVAAL,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Navorsingsgroep Varswaterbiol.
P. Du Toit, J. Vermeulen, and H. J. Schoonbee.
Tydskr Natuurwet. Vol 12 No 3, p 129-147, 1972, Illus. English summary.
Identifiers: Age, *Cichlidae, Length, Mass, Pisces, Reservoirs, Scale, *Tilapia-Mossambica, *Transvaal(Loskop Dam Reservoir), *South Africa.

A close relationship exists between total length and scale-radius of T. mossambica. No accurate assessment of the age of T. mossambica in Loskop Dam is possible from either length or weight determinations.--Copyright 1973, Biological Abstracts, Inc.
W74-09754

NOTES ON THE RATIO TOTAL LENGTH/SCALE RADIUS OF TILAPIA MOSSAMBICA PETERS (PISCES:CICHLIDAE) IN THE LOSKOP DAM RESERVOIR EASTERN TRANSVAAL,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Navorsingsgroep Varswaterbiol.
J. Vermeulen, H. J. Schoonbee, and P. Du Toit.
Tydskr Natuurwet Vol 12, No 3, p 148-152, 1972, Illus. English summary.
Identifiers: *Cichlidae, Length, Pisces, Reservoirs, Scale, Season, *Tilapia-Mossambica, *Transvaal(Loskop Dam reservoir), *South Africa.

A seasonal study of the total length/scale radius of T. mossambica in the Loskon Dam Reservoir, South Africa during the period April 1967-July 1968 shows that drought may influence the value of b in the formula: Scale radius = a + b (total length) (a = constant).--Copyright 1973, Biological Abstracts, Inc.
W74-09768

NOTES ON THE CONDITION FACTOR FOR TILAPIA MOSSAMBICA PETERS (PISCES:CICHLIDAE) IN LOSKOP DAM RESERVOIR, EASTERN TRANSVAAL,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Navorsingsgroep Varswaterbiol.
H. J. Schoonbee, J. Vermeulen, and P. Du Toit.
Tydskr Natuurwet, Vol 12, No 3, p 153-157, 1972, Illus. English summary.
Identifiers: Age, *Cichlidae, Length, Pisces, Reservoirs, *Tilapia-mossambica, *Transvaal(Loskop Dam reservoir), Weight, *South Africa.

A modified formula is used to calculate the condition factor for T. mossambica. For the purpose of comparison, condition factors calculated should be employed for the same age groups only, for the same species of fish. In such a case it is considered justified to compare fish from the same body of water for various seasons of the year, or even for a period of years.--Copyright 1973, Biological Abstracts, Inc.
W74-09781

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

UNIVERSITY RESEARCH AND PRACTICE: AN INSTITUTIONAL CONFRONTATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6E.
W74-09421

WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN MINNESOTA, 1974 - GUIDELINES FOR RESEARCH PROGRAMS,
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-09656

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1972-JUNE 30, 1973.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service as PB-233 728, $8.00 in paper copy, $1.45 in microfiche. Report No 28, March 1974. 95 p. OWRR A-999-CAL(8).

Descriptors: *Freshwater, *Research and development, *Water resources institute, Universities, Training, Education, *California, Grants, Contracts, *Projects, *Project benefits.

The principal investigators of fresh water projects sponsored by the Water Resources Center have submitted their annual reports, from which the most essential information has been abstracted to form this narrative section. The individual narratives have been purposely kept brief. Each emphasizes, wherever possible, the 'hard' results and the actual or potential applications of those results to benefit affected interests. Shown also are starting and scheduled ending dates for each research project. The reader may infer from these the relative degree of progress achieved to date, together with an indication of when further information might become available--usually at least six months after completion of the project for any detailed account. The Report covers both State of California and Federally funded research activities. (Snyder-California, Davis)
W74-09659

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1972-JUNE 30, 1973.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9A.
W74-09659

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

HYDROLOGIC DATA STORAGE AND RETRIEVAL SYSTEM,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 07C.
W74-09401

10C. Secondary Publication And Distribution

COMMUNICATIONS FOR URBAN WATER RESOURCES MANAGEMENT--A REVIEW AND ANNOTATED BIBLIOGRAPHY,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 06B.
W74-09251

GROUND WATER QUALITY AND SOLID WASTE MANAGEMENT-- A SELECTIVE BIBLIOGRAPHY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05E.
W74-09319

10D. Specialized Information Center Services

AN INFORMATION SYSTEM FOR THE MANAGEMENT OF LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 02H.
W74-09752

SUBJECT INDEX

ABLATION
Analysis of the Run-Off and Flow Routing for a Mountain Glacier Basin,
W74-09328 2C

Variations in the Relation Between Glacier Discharge and Meteorological Elements,
W74-09330 2C

Some Viewpoints on the Internal Drainage of Glaciers,
W74-09333 2C

Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

ABSORPTION
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

ACID MINE WATER
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

Coal Mining and Its Effect on Water Quality,
W74-09592 5B

ACIDS
Subsurface Disposal of Pickle Liquor,
W74-09583 5E

ACTINOMYCETES
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

ACTIVATED CARBON
Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

Inroads to Activated Carbon Treatment,
W74-09461 5D

A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

ACTIVATED SLUDGE
Disposal of Aircraft Washrack Waste Water,
W74-09376 5D

Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

Control of Biological Solids Concentration in Extended Aeration,
W74-09508 5D

Small Town Spends a Big $8 Million,
W74-09711 5D

Alternative Strategies for Managing Wastewater,
W74-09712 5D

ADMINISTRATION
Water Resources-Powers of the Commissioner of Natural Resources.
W74-09298 6E

Managing Water Resources: Basic Considerations and Problems,
W74-09734 6B

ADMINISTRATIVE AGENCIES
Environmental Statements--Engineer Regulations on Preparation and Coordination.
W74-09258 6E

Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

ADMINISTRATIVE REGULATIONS
Beach and Shore Preservation Act.
W74-09297 6E

ADSORPTION
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

AERATED LAGOONS
Oxidation and Aerated Lagoon Operation,
W74-09452 5D

AERATION
Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

Control of Biological Solids Concentration in Extended Aeration,
W74-09508 5D

Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

Treatment of Swine Wastes,
W74-09684 5D

Small Town Spends a Big $8 Million,
W74-09711 5D

Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

AERATION TANK
Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

AERATOR-AGITATORS
Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

AEROBIC TREATMENT
Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

AESTHETICS
Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

AESTHETICS FACILITIES
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

AGRIBUSINESS
Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

AGRICULTURAL POLLUTION
Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

AGRICULTURAL RUNOFF
Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

AGRICULTURAL WASTE MANAGMENT
Public Relations Aspects of Agricultural Waste Management,
W74-09666 5G

AGRICULTURE
Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

Accelerated Growth in Agricultural Production and the Intersectoral Transfer of Resources,
W74-09550 3F

AGRICULTURE

Agriculture in the Environment,
W74-09664 5D

Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

AIR DEMAND
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

AIR ENTRAINMENT
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

AIR POLLUTION
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Comparing Effluent Releases From Nuclear and Fossilfueled Power Plants,
W74-09503 5B

Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

Agriculture in the Environment,
W74-09664 5D

Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

AIR POLLUTION EFFECTS
Health Effects of Environmental Pollutants,
W74-09547 5C

Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

ALABAMA
Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

Montgomery V. Ellis (Action Seeking to Enjoin Stream Channelization).
W74-09299 6E

Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

ALASKA
Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

The Effects of Land Use on Salmon Production,
W74-09411 4C

55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

ALGAE
Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

ALGORITHMS
Hydraulics of a Water Supply System with Fluctuating Water Demand, (Hydraulik eines Wasserversorgungssystems mit fluktuierenden Bedarfsmengen),
W74-09726 8B

ALKALINITY
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

ALLUVIAL AQUIFERS
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

ALPINE
Snow Survey and Vegetation Growth in High Mountains (Swiss Alps),
W74-09320 2C

ALTERNATE PLANNING
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

ALTERNATIVE PLANNING
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

ALUM
Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

ALUMINUM
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

ALUMINUM DOORS
Aluminum Pit Doors Provide Easy Access to a Retention Basin.
W74-09515 5D

ALZHEIMER'S DISEASE
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

AMENDMENTS
Economic Impact of FWPCA Water Effluent Standards and Goals.
W74-09497 5D

Cost of Achieving E.P.A.'S BPCTCA and Zero Discharge.
W74-09748 5G

AMMONIA
A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

AMPHIPODA
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

ANABAENA
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

ANAEROBIC DIGESTION
Stability and Control of Anaerobic Digestion,
W74-09434 5D

Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

ANALYTICAL TECHNIQUES
Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

Heavy Metal Estimation in Biological Systems,
W74-09580 5B

Detection of Trace Metals in Water,
W74-09581 5A

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

Lead Concentration Found in Human Blood in Association with Lead Colic,
W74-09764 5C

A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

ANIMAL PATHOLOGY
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

ANION EXCHANGE
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

ANIONS
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

ANNA MARIA KEY (MANATEE COUNTY-FLA
Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

ANNELIDS
Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

ANTARCTIC
Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

ANTIMONY
Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

APLOCHEILUS LATIPES
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

APPRECIATION
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

APPROPRIATION
Water Resources-Powers of the Commissioner of Natural Resources.
W74-09298 6E

AQUA REGIA
Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

AQUATIC ENVIRONMENT
Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

Contamination of Waters.
W74-09304 6E

AQUATIC INSECTS
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

AQUATIC LIFE
Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

AQUATIC MICROORGANISMS
Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

AQUATIC WEED CONTROL
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

AQUICULTURE
The Commerctel Feasibility of Rearing Pompano, Trachinotus carolinus (Linnaeus), in Cages,
W74-09566 8I

AQUIFER TESTING
Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

AQUIFERS
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

ARCTIC
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

ARCTIC OCEAN
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

ARGENTINA (RIO COLORADO)
A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

ARID LANDS
Water Problems in the Arid Wesrn Regions of the USA, (In Russian),
W74-09469 4A

ARMERIA MARITIMA
Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

ARSENIC COMPOUNDS
Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

Study of Arsenic Removal from Drinking Water,
W74-09776 5F

ARTIFICIAL FEEDING
Artificial Feeding of Carp Fry,
W74-09501 8I

ARTIFICIAL LAKES
The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

ATLANTIC OCEAN
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

ATOMIC ABSORPTION SPECTROSCOPY
Detection of Trace Metals in Water,
W74-09581 5A

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

ATTITUDES
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

AUSTRALIA
Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

AUSTRIA
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

AUSTRIA (VIENNA)
Realization of the Danube Flood Protection Project for Vienna (Das Werden des Projektes fuer den Donauhochwasserschutz von Wien),
W74-09739 4A

AUTOMATED HANDLING
Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

AUTOMOBILE EMISSIONS
Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

AVALANCHES
Avalanche Studies in the San Juan Mountains of Southwestern Colorado,
W74-09607 2C

BACTERIA
Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

BACTERIAL STUDIES
An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09723 2I

BACTERIOLOGICAL STUDIES
Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

BALTIMORE (MD
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

BARNLOT RUNOFF
Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

BASELINE STUDIES
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

BASS
Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

BAYESIAN DECISION ANALYSIS
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

BAYS
An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

BEACH EROSION
Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

Beach and Shore Preservation Act.
W74-09297 6E

BEACHES
Beach and Shore Preservation Act.
W74-09297 6E

BEAR CREEK (ALA)
Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

BED LOAD
Influence of Suction and Blowing on Entrainment of Sand Particles,
W74-09616 2J

Stochastic Analysis of Dune Bed Profiles,
W74-09619 2J

BEDS
Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

BENTHIC FAUNA
A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

BENTHOPHILUS-STELLATUS
Benthophilus stellatus (Sauvage) in the Kuibyshev Reservoir (In Russian),
W74-09433 2H

BENTHOS
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

BENTHOS FORMATION
Formation of the Benthos of the Ruz Reservoir in the First Years of its Existence (1966-1967), (In Russian),
W74-09507 2H

BERYLLIUM
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

BIBLIOGRAPHIES
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

BIOASSAY
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

BIOCHEMICAL OXYGEN DEMAND
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

Chemical Addition to Trickling Filter Plants,
W74-09710 5D

BIODEGRADATION
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

BIOLOGICAL MEMBRANES
A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

BIOLOGICAL TREATMENT
Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

BIOTA
Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

BIOTOPES
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

BIXLER RUN (PA)
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

BLEACHING WASTES
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

BLOCK ISLAND SOUND (NY)
An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

BLOOD
Significance of Lead Isotope Composition in Blood,
W74-09772 5A

BOATING
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

BODIES OF WATER
Impermanent Lakes,
W74-09261 2H

BORON
Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

BOTTOM SEDIMENTS
Charleston Area Sediment Samples,
W74-09386 5A

BOTTOM STUDIES
Seismic Profiles, Cooper River.
W74-09388 2L

BOUNDARY DISPUTES
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

BRAIDING
Variation in Width-Discharge Relation and Some Implications for Hydraulic Geometry,
W74-09632 8B

BRAZOS RIVER BASIN (TEX)
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

BRAZOS RIVER (TEXAS)
Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

BREAKWATERS
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

BREAM
Feeding and Growth of Young Bream at Spawning and Rearing Farms of the Volga Delta Under Stream-Flow Control Conditions, (In Russian),
W74-09313 8I

BRIDGES
Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

Design Criteria and Research Needs,
W74-09400 4A

BRUNSWICK RIVER (GA)
Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

BUDGETING
Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

Capital Budgeting for Pollution Control,
W74-09558 5G

BUENA VISTA (VA
Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

BUNTER SANDSTONES
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

BURBANK (CALIF)
Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

CADMIUM
Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

A Survey of Trace Metals in Human Hair,
W74-09573 5B

Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

CALIBRATIONS
Calibration of U.S. Geological Survey Rainfall/Runoff Model for Peak Flow Synthesis--Natural Basins,
W74-09603 2A

CALIFORNIA
Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

Ground-Water Data, 1972, Indian Wells Valley, California,
W74-09352 4B

An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

Dewatering Digested Primary Sludge,
W74-09441 5D

Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

Problems Related to the Evaluation of Groundwater Resources of the Crystalline Rock Area, San Diego County, California,
W74-09544 2F

Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

Dairy Manure Waste Handling Systems,
W74-09674 5D

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

CANADA
Record of Two Jokullhlaups,
W74-09331 2C

Subglacial Leakage of Summit Lake, British Columbia, by Dye Determinations,
W74-09332 2C

Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

International Field Year for the Great Lakes.
W74-09350 2H

Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

Chloride and Lead in Urban Snow,
W74-09468 5B

Use of Decision Theory in Reservoir Operation,
W74-09478 4A

How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

On the Characterization of the Parasite Fauna of Yellow Perch (Perca fluviatilis L.) in Five Lakes, in Southern Ontario, Canada,
W74-09541 5B

The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

CANALS
The Coastal Interceptor Waterway,
W74-09614 5G

CAPITAL MOBILITY
Accelerated Growth in Agricultural Production and the Intersectoral Transfer of Resources,
W74-09550 3F

CARBON TREATMENT
Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

CARBOXYMETHYLCELLULOSE
Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

CARP FRY
Artificial Feeding of Carp Fry,
W74-09501 8I

CASINGS
Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

CAST IRON PIPES
Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

CATHODIC PROTECTION
Fundamentals of Cathodic Protection,
W74-09548 8G

CATIONS
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

CATSKILL (N
Sewage and Storms Get the Full Treatment,
W74-09499 5D

CATTLE
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

CAYUGA LAKE BASIN (NY)
Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

CELLULOSE
Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

CEMENT
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

CENTERVILLE QUADRANGLE (KY)
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

CENTRIFUGATION
Dewatering Digested Primary Sludge,
W74-09441 5D

A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

CHANNEL IMPROVEMENT
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

CHANNEL MORPHOLOGY
Stochastic Analysis of Dune Bed Profiles,
W74-09619 2J

Variation in Width-Discharge Relation and Some Implications for Hydraulic Geometry,
W74-09632 8B

CHANNELIZATION
Montgomery V. Ellis (Action Seeking to Enjoin Stream Channelization).
W74-09299 6E

CHANNELS
Recent Federal Legislation Significant in Environmental Planning Programs of the State of Texas.
W74-09316 6E

CHARLES RIVER (MASS)
Magnetic Clarifier.
W74-09520 5D

CHARLESTON HARBOR (SC)
The Cooper River Environmental Study.
W74-09379 2L

Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

Charleston Area Sediment Samples,
W74-09386 5A

Surface Water Hydraulics.
W74-09387 2L

CHARLESTON (SC)
Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

CHATHAM HARBOR (MASS
Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

CHATTOOGA RIVER
Proposed Wild and Scenic Chattooga River and the Conveyance of Certain Public Lands.
W74-09310 6E

CHEMICAL ANALYSIS
A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

CHEMICAL OXYGEN DEMAND
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

CHEMICAL PRECIPITATION
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

CHEMICAL RECOVERY
Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

CHEMICAL WASTES
Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

Subsurface Disposal of Pickle Liquor,
W74-09583 5E

CHESAPEAKE BAY
Tidal Currents, Sediment Transport, and Sand Banks in Chesapeake Bay Entrance, Virginia,
W74-09368 2L

CHINA SEA
The East China Sea: The Role of International Law in the Settlement of Disputes.
W74-09286 6E

CHIRONOMUS-PLUMOSUS
Formation of the Benthos of the Ruz Reservoir in the First Years of its Existence (1966-1967), (In Russian),
W74-09507 2H

CHLORIDES
Chloride and Lead in Urban Snow,
W74-09468 5B

CHLORINATED HYDROCARBONS
Pesticide Analysis in Water,
W74-09484 5A

CHLORINATION
Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

CHLORINE
A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

CHLORINE CONTACT TANK
A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

CHLOROPHYLL
Content and Composition of Plant Pigments in the Rybinsk Reservoir (In Russian),
W74-09446 2H

CHROMATOGRAPHY
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

CICHLIDAE
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

CITIES
Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

Public Water Supplies in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09640 7C

Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

CITIZEN PARTICIPATION
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

CIVIL ENGINEERING
Agricultural Waste Management,
W74-09504 5D

CIVIL LAW
A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

CLAYS
Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

CLEANING
Disposal of Aircraft Washrack Waste Water,
W74-09376 5D

'Pig' Brings Back Capacity,
W74-09516 8C

Apparatus for Releasing Chemicals Clearing and Cleaning Waste Pipes,
W74-09725 5D

CLEMSON RESEARCH WATERSHED (SC)
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

CLEVELAND (OHIO)
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

CLOGGING
Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

CLOUD PHYSICS
Project CUM II--Studies of the Rain Parameters of Randomly Seeded Warm and Cold Cumuli,
W74-09370 3B

An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

CLOUD SEEDING
Results Generated from a One-Dimensional Warm Fog Model Which Simulates Hygroscopic Seeding,
W74-09322 3B

Project CUM II--Studies of the Rain Parameters of Randomly Seeded Warm and Cold Cumuli,
W74-09370 3B

Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

CLOUD SEEDING (HYGROSCOPIC)
Project CUM II--Studies of the Rain Parameters of Randomly Seeded Warm and Cold Cumuli,
W74-09370 3B

CLUSTER-WELL CONCEPT
Two Tests for the Cluster Well Concept,
W74-09549 8A

COAGULATION
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

COAL MINES
Coal Mining and Its Effect on Water Quality,
W74-09592 5B

COALS
Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

COASTAL PLAINS
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

COASTAL WATERS
Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

COASTS
Thibodaux Public Hearing Testimony.
W74-09288 6E

Recent Federal Legislation Significant in Environmental Planning Programs of the State of Texas.
W74-09316 6E

Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

COATINGS
State-of-the-Art of Waste Disposal in the Coatings Industry (As of June 1973),
W74-09506 5E

COBALT
Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

COCKROACH
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

COLIFORMS
Ozone: An Alternative to Chlorine,
W74-09714 5D

COLLECTOR CHANNELS
Flood Runoff Systems with Collector Channel and Fast Discharge for Dams (Volgyzarogatak gyujtocsatornas, surrantos arapasztoi),
W74-09720 8A

COLOR
Inroads to Activated Carbon Treatment,
W74-09461 5D

A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

COLORADO
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

'Pig' Brings Back Capacity,
W74-09516 8C

Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

Evaporation Losses of Windblown Snow, and the Potential for Recovery,
W74-09611 2D

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

COLORADO RIVER
River Regulations as Influence on Peak Discharge,
W74-09617 4A

COMBINED SEWER SYSTEMS
Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

COMBINED SEWERS
Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

COMMERCIAL FISH
The Commercial Feasibility of Rearing Pompano, Trachinotus carolinus (Linnaeus), in Cages,
W74-09566 8I

COMMERCIAL FISHING
Offshore Shrimp Fisheries Act of 1973--Legislative History.
W74-09277 6E

COMMON LAW
Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

COMMUNICATION
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

COMMUNITY HYGIENE
Water Supply Improvement Project,
W74-09542 5B

COMPARATIVE BENEFITS
Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

COMPARATIVE COSTS
Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

COMPOSTING
Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

Windrow Composting of Swine Wastes,
W74-09676 5D

COMPREHENSIVE PLANNING
Environment: A New Focus for Land-Use Planning.
W74-09412 4A

A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

COMPRESSIVE STRENGTH
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

COMPUTER MODELS
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

COMPUTER PROGRAMS
Calculation of Natural Catchment Infiltration by Computer,
W74-09367 7C

Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

Calculation of Soil Hydraulic Conductivity from Soil-Water Retention Relationships,
W74-09599 2G

Calibration of U.S. Geological Survey Rainfall/Runoff Model for Peak Flow Synthesis--Natural Basins,
W74-09603 2A

COMPUTER STUDIES
Stability and Control of Anaerobic Digestion,
W74-09434 5D

CONCRETE
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

CONCRETE-SURFACED FEEDLOTS
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

CONDUITS
'Pig' Brings Back Capacity,
W74-09516 8C

CONFERENCES
Clean Water--A Challenge to the Nation, Highlights and Recommendations of the National Conference on Water Pollution.
W74-09260 5G

Groundwater pollution.
W74-09590 5B

Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

CONFINEMENT BUILDINGS
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

CONFINEMENT PENS
Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

CONGRESSIONAL HEARINGS
Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Wild and Scenic Rivers Act Amendments Part 1.
W74-09307 6E

Replacement of the American Falls Dam in Idaho, Part 1.
W74-09309 6E

CONSERVATION
Thibodaux Public Hearing Testimony.
W74-09288 6E

Wetlands.
W74-09301 6E

CONSTRUCTION
Some Historical Statistics Related to Future Standards,
W74-09505 5D

Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

CONTAMINANTS
Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

CONTINENTAL SHELF
Offshore Shrimp Fisheries Act of 1973--Legislative History.
W74-09277 6E

The East China Sea: The Role of International Law in the Settlement of Disputes.
W74-09286 6E

A Bill to Amend the Outer Continental Shelf Lands Act and to Authorize the Secretary of the Interior to Regulate the Construction and Operation of Deepwater Port Facilities,
W74-09311 6E

Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

CONTINUOUS FLOW
Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

CONTROL
Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

CONTROL SYSTEMS
Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

CONTROLLED DRAINAGE
Reid V. El Paso Construction Co. (Damages for Alteration of Drainage Conditions).
W74-09296 6E

CONVEYANCE STRUCTURES
Priming Unit for Distributing Priming Water to Multiple Sewer Line Water Traps,
W74-09732 5D

COOPER RIVER (SC)
The Cooper River Environmental Study.
W74-09379 2L

Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

The Vegetation of the Cooper River Estuary,
W74-09383 2L

Report on 'In Situ' Benthic Respiration and Vertical Oxygen: Temperature Profiles.
W74-09384 5C

Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

Charleston Area Sediment Samples,
W74-09386 5A

Surface Water Hydraulics.
W74-09387 2L

Seismic Profiles, Cooper River.
W74-09388 2L

Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

COPPER
Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

CORN (FIELD)
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

CORPUS CHRISTI BAY (TEX)
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

CORRELATION ANALYSIS
Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

CORROSION
Operation and Maintenance of Wells,
W74-09524 8G

Fundamentals of Cathodic Protection,
W74-09548 8G

CORROSION CONTROL
Operation and Maintenance of Wells,
W74-09524 8G

Fundamentals of Cathodic Protection,
W74-09548 8G

COST ANALYSIS
Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

COST-BENEFIT ANALYSIS
The Worth of Data in Hydrologic Design,
W74-09399 7C

Capital Budgeting for Pollution Control,
W74-09558 5G

Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

COST COMPARISONS
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

COSTS
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

CREVASSES (GLACIAL)
Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

CROP PRODUCTION
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

CROP REARING
Fish Rearing in the Rice Fields of the Volga Delta, (In Russian).,
W74-09284 8I

CROP RESPONSE
Humidity Effects on Yield and Water Relations of Nine Crops,
W74-09796 3C

CRYSTALLINE ROCKS
Problems Related to the Evaluation of Groundwater Resources of the Crystalline Rock Area, San Diego County, California,
W74-09544 2F

CULVERTS
Optimal Design for Highway Drainage Culverts,
W74-09630 4A

CUMULONIMBUS CLOUDS
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

CYANIDE
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

CYANOPHYTA
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

CYTOLOGICAL STUDIES
Granules Containing Lead in Isolated Mitochondria,
W74-09787 5C

DAIRY INDUSTRY
Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

Dairy Manure Waste Handling Systems,
W74-09674 5D

Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

Lagoons for Milking Center Wastes,
W74-09708 5D

DALLAS (TEX)
Significance of Lead Isotope Composition in Blood,
W74-09772 5A

DAM CONSTRUCTION
Replacement of the American Falls Dam in Idaho, Part 1.
W74-09309 6E

DAMAGES
Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

DAMS
Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

DANUBE RIVER
Realization of the Danube Flood Protection Project for Vienna (Das Werden des Projektes fuer den Donauhochwasserschutz von Wien),
W74-09739 4A

DATA COLLECTION
Hydrologic Data Storage and Retrieval System,
W74-09401 7C

DATA COLLECTIONS
International Field Year for the Great Lakes.
W74-09350 2H

Recording Floods and Flood Damage,
W74-09397 4A

The Worth of Data in Hydrologic Design,
W74-09399 7C

Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

A General Purpose Event Water-Level Recorder,
W74-09604 7B

Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

DATA PROCESSING
Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

DATA STORAGE AND RETRIEVAL
Hydrologic Data Storage and Retrieval System,
W74-09401 7C

DECISION MAKING
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

DECISION MAKING

Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

Effluent Charges: A Critique,
W74-09560 5G

Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

DECISION THEORY
Use of Decision Theory in Reservoir Operation,
W74-09478 4A

DEDICATION
Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

DEEPWATER PORTS
A Bill to Amend the Outer Continental Shelf Lands Act and to Authorize the Secretary of the Interior to Regulate the Construction and Operation of Deepwater Port Facilities,
W74-09311 6E

DEER FLY
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

DEICING
Road Salt, Drinking Water and Safety,
W74-09537 4C

DELAWARE
Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

DELTAS
Dynamics of the Vegetation of the Sands of the Ancient and Present Delta of the Syr-Dar'ya River,
W74-09750 2I

DEMAND
Use of Decision Theory in Reservoir Operation,
W74-09478 4A

DENITRIFICATION
Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

DENVER (COLO)
'Pig' Brings Back Capacity,
W74-09516 8C

DENVER WATER DEPARTMENT (COLO)
Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

DEPOSITION (SEDIMENTS)
Glacial Origin of Pro-Glacial Boulders,
W74-09336 2C

DEPTH PREDICTION
Depth Prediction for Earth-Penetrating Projectiles,
W74-09534 8D

DESALINATION
Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

DESIGN
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

Beyond 'City Water': Rural Water System Design,
W74-09538 6B

DESIGN CRITERIA
Lagoons for Milking Center Wastes,
W74-09708 5D

DESIGN FLOOD
Flood Plain Information; Pocotaligo River-Turkey Creek-Cane Savannah Creek-Green Swamp-Shot Pouch Creek-Rock Bluff Swamp, Sumter County, South Carolina.
W74-09355 4A

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

Flood Plain Information; Kit and Northeast Creeks; Research Triangle Area, Durham and Wake Counties, North Carolina.
W74-09357 4A

Flood Plain Information; Reedy River, Richland Creek, Greenville County, South Carolina.
W74-09358 4A

Highways and the Catastrophic Floods of 1972.
W74-09390 2E

Design Criteria and Research Needs,
W74-09400 4A

DESIGN FLOW
Optimal Design for Highway Drainage Culverts,
W74-09630 4A

DETERGENTS
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

DEWATERING
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

Dewatering Digested Primary Sludge,
W74-09441 5D

Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

DIFFUSION
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

DIPTERA
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

DIRT-SURFACED FEEDLOTS
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

DISASTERS
Highways and the Catastrophic Floods of 1972.
W74-09390 2E

Flood Damage in South Dakota,
W74-09394 2E

DISCHARGE
Protection and Improvement of Waters: Pollution Control.
W74-09300 6E

DISCHARGE COEFFICIENT
Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

DISCHARGE (WATER)
Impermanent Lakes,
W74-09261 2H

Record of Two Jokullhlaups,
W74-09331 2C

Subglacial Leakage of Summit Lake, British Columbia, by Dye Determinations,
W74-09332 2C

Geyser-Like Water Spouts at Werenskioldbreen, Spitsbergen,
W74-09334 2C

Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Water Pollution Prevention in South Wales,
W74-09735 5G

DISEASES
Health Effects of Environmental Pollutants,
W74-09547 5C

DISINFECTION
Ozone: An Alternative to Chlorine,
W74-09714 5D

Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

DISSOLVED OXYGEN
Report on 'In Situ' Benthic Respiration and Vertical Oxygen: Temperature Profiles.
W74-09384 5C

A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

DISTRIBUTION
Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

DISTRIBUTION PATTERNS
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

DNA
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

DOBOY SOUND (GA)
Hydrographic Framework of the Doboy Sound Estuary and Surveys of the Other Tidal Inlets Along the Coast of Georgia,
W74-09582 2L

DOCKS
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

DOLOMITE
Fatigue Behavior of Rock,
W74-09523 8E

DOMESTIC WATER
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

DOOR COUNTY (WIS
Groundwater Quality. Door County, Wisconsin.
W74-09565 5B

DRAINAGE
Drainage--Sewage Disposal; Contamination of Lake Michigan.
W74-09292 6E

Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

Drainage Investigations and Findings on the Gotvand Project - Iran,
W74-09797 2G

DRAINAGE ENGINEERING
Experimental Field Studies Required for the Design of Drainages, (Studii experimentale in teren, necesare proiectarii drenajelor),
W74-09495 4A

DRAINAGE SYSTEMS
General Plan for Recommended Storm Drainage Facilities, Marion County, Ohio.
W74-09359 5D

Experimental Field Studies Required for the Design of Drainages, (Studii experimentale in teren, necesare proiectarii drenajelor),
W74-09495 4A

DRAWDOWN
The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

DREDGING
Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

DRILLING
(Water Well Contractor Survey).
W74-09529 4B

DROUGHTS
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

DRY SEASONS
Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

DRYING
Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

DUNES
Stochastic Analysis of Dune Bed Profiles,
W74-09619 2J

DUTY OF WATER
The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

EARTHQUAKES
Environmental Status of the Lake Michigan Region: Volume 7. Earthquake History and Measurement with Application to the Lake Michigan Drainage Basin,
W74-09407 2H

Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

ECOLOGY
Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Ecological Concepts and Applications to Planning,
W74-09418 6B

Ecological River Basin Management,
W74-09559 4A

ECONOMIC EFFICIENCY
Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

ECONOMIC FEASIBILITY
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

ECONOMIC IMPACT
Economic Impact of FWPCA Water Effluent Standards and Goals.
W74-09497 5D

Groundwater Quality. Door County, Wisconsin.
W74-09565 5B

Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

Cost of Achieving E.P.A.'S BPCTCA and Zero Discharge.
W74-09748 5G

ECONOMIC PREDICTION
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

ECONOMICS
Seabed Mineral Resource Production and the Free Market,
W74-09287 6E

Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

Irrigation Cost for Land Disposal,
W74-09428 5D

ECOSYSTEM
Ecological Concepts and Applications to Planning,
W74-09418 6B

ECOSYSTEMS
Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

ECOSYSTEMS

Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

Energy Flux Studies in a Confierous Forest Ecosystem,
W74-09615 2D

EFFLUENTS
Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

Effluent Charges: A Critique,
W74-09560 5G

Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

ELECTRIC POWER PRODUCTION
Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

ELECTROCHEMISTRY
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

ELECTROLYTES
Fundamentals of Cathodic Protection,
W74-09548 8G

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

ELECTRONIC FOAM SENSOR
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

ELECTROPHORESIS
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

ELECTROPLATING INDUSTRY
Plating Pollution: The Latest From EPA, Part 1,
W74-09491 5B

ELECTROPLATING WASTES
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

ELK RIVER
Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

ELK RIVER (ALA-TENN)
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

EMULSIONS
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 3,
W74-09321 5G

ENERGY BUDGET
Energy Flux Studies in a Confierous Forest Ecosystem,
W74-09615 2D

ENGINEER ESTIMATES
Some Historical Statistics Related to Future Standards,
W74-09505 5D

ENVIRONMENT
Environment: A New Focus for Land-Use Planning.
W74-09412 4A

The Future of the Urban Habitat,
W74-09413 6E

Ecological Concepts and Applications to Planning,
W74-09418 6B

An Evaluation of the Impact of Land Use on Environmental Quality,
W74-09419 4A

University Research and Practice: An Institutional Confrontation,
W74-09421 6E

Agriculture in the Environment,
W74-09664 5D

Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

ENVIRONMENTAL CONTROL
Protection and Improvement of Waters: Pollution Control.
W74-09300 6E

The Future of the Urban Habitat,
W74-09413 6E

Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

Paper Industry and Environmental Quality,
W74-09475 5D

ENVIRONMENTAL EFFECTS
Environmental Statements--Engineer Regulations on Preparation and Coordination.
W74-09258 6E

Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Montgomery V. Ellis (Action Seeking to Enjoin Stream Channelization).
W74-09299 6E

The Environmental Impact Concept, and Its Effect on the National Gas Industry,
W74-09489 5C

Ecological River Basin Management,
W74-09559 4A

Environmental Disruption: Implications for Economic Planning,
W74-09564 6B

ENVIRONMENTAL IMPACT STATEMENT
New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

ENVIRONMENTAL IMPACT STATEMENT (EIS)
Environmental Statements--Engineer Regulations on Preparation and Coordination.
W74-09258 6E

ENVIRONMENTAL IMPACT STATEMENTS
Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

The Environmental Impact Concept, and Its Effect on the National Gas Industry,
W74-09489 5C

ENVIRONMENTAL POLLUTANTS
Health Effects of Environmental Pollutants,
W74-09547 5C

ENVIRONMENTAL PROTECTION AGENCY
Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

ENVIRONMENTAL QUALITY
Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

ENVIRONMENTAL SANITATION
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

ENZYMATIC DIGESTION
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

ENZYMES
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

EQUILIBRIUM
Controlling Pollution by Price and Standard Systems: A General Equilibrium analysis,
W74-09561 5G

EQUIPMENT
Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

ERNST'S METHOD
Experimental Field Studies Required for the Design of Drainages, (Studii experimentale in teren, necesare proiectarii drenajelor),
W74-09495 4A

EROSION
Water at the Bed of a Glacier,
W74-09340 2C

EROSION CONTROL
Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

Soil and Water Conservation District Law.
W74-09291 6E

Wetlands.
W74-09301 6E

ERTS
An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

ESTIMATES
Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

ESTIMATING
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

ESTUARIES
Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Tidal Currents, Sediment Transport, and Sand Banks in Chesapeake Bay Entrance, Virginia,
W74-09368 2L

The Cooper River Environmental Study.
W74-09379 2L

Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

Report on 'In Situ' Benthic Respiration and Vertical Oxygen: Temperature Profiles.
W74-09384 5C

Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

Charleston Area Sediment Samples,
W74-09386 5A

Surface Water Hydraulics.
W74-09387 2L

Seismic Profiles, Cooper River.
W74-09388 2L

Hydrographic Framework of the Doboy Sound Estuary and Surveys of the Other Tidal Inlets Along the Coast of Georgia,
W74-09582 2L

Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

ESTUARINE ENVIRONMENT
The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

EUBACTERIA
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

EUROPE (FOREST-STEPPE)
Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

EUTROPHICATION
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

EVALUATION
An Evaluation of the Impact of Land Use on Environmental Quality,
W74-09419 4A

Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

EVALUATION

Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

EVAPORATION
Evaporation Losses of Windblown Snow, and the Potential for Recovery,
W74-09611 2D

EVAPORATOR CONDENSATES
Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

EVAPOTRANSPIRATION
Water Loss Estimates from a Fallow Soil,
W74-09546 2D

EVENT RECORDERS
A General Purpose Event Water-Level Recorder,
W74-09604 7B

EVERETT (WASH)
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

EXPLORATION
Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

FAILURE (MECHANICS)
Fatigue Behavior of Rock,
W74-09523 8E

FAIRFAX COUNTY (VA)
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

FARM MANAGEMENT
Agricultural Waste Management,
W74-09504 5D

FARM WASTES
Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

Agricultural Waste Management,
W74-09504 5D

Groundwater Pollution by Agriculture,
W74-09595 5B

Waste Management Research.
W74-09663 5D

Agriculture in the Environment,
W74-09664 5D

Public Relations Aspects of Agricultural Waste Management,
W74-09666 5G

Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

Dairy Manure Waste Handling Systems,
W74-09674 5D

Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

Windrow Composting of Swine Wastes,
W74-09676 5D

Reduction in Moisture and Daily Removal of Wastes from Caged Laying Hens,
W74-09677 5D

Undercage Drying of Laying Hen Manure,
W74-09678 5D

Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

Treatment of Swine Wastes,
W74-09684 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

Treatment and Disposal of Swine Waste,
W74-09704 5D

Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

Lagoons for Milking Center Wastes,
W74-09708 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

FASCIOLA-HEPATICA
Some Practical Aspects Concerning the Use of The Molluscicide N-Tritylmorpholine (Frescon) for the Control of Fascioliasis,
W74-09525 5C

FATHEAD MINNOWS
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

FATIGUE (MECHANICS)
Fatigue Behavior of Rock,
W74-09523 8E

FEDERAL GOVERNMENT
Report on Great Lakes Water Quality for 1972.
W74-09257 5G

Environmental Statements--Engineer Regulations on Preparation and Coordination.
W74-09258 6E

Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

Wild and Scenic Rivers Act Amendments Part 1.
W74-09307 6E

Replacement of the American Falls Dam in Idaho, Part 1.
W74-09309 6E

Proposed Wild and Scenic Chattooga River and the Conveyance of Certain Public Lands.
W74-09310 6E

A Bill to Assure that the Public is Provided with Safe Drinking Water, and for Other Purposes.
W74-09314 6E

Recent Federal Legislation Significant in Environmental Planning Programs of the State of Texas.
W74-09316 6E

Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

U.S. Coast Guard Oil Pollution Investigation and Control School.
W74-09753 5G

FEDERAL WATER POLLUTION CONTROL ACT

Economic Impact of FWPCA Water Effluent Standards and Goals.
W74-09497 5D

Cost of Achieving E.P.A.'S BPCTCA and Zero Discharge.
W74-09748 5G

FEED LOTS

Waste Management Research.
W74-09663 5D

Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

FEEDLOTS

Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

FEEDS

Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

FELINES

Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

FERRIC HYDROXIDE

Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

FIBER-GLASS PIPES

Installation of Large-Diameter Fiber-Glass Flexible Pipe in Municipal Systems,
W74-09727 8A

FIBERS (PLANT)

Paper Industry and Environmental Quality,
W74-09475 5D

FILTERS

Studies on the Suitability of Microstrainers for the Removal of Suspended Matter from Biological Clearing Facility Effluents (Untersuchungen ueber die Eignung des Mikrosiebes zur Entnahme suspendierter Stoffe aus den Ablaeufen biologischer Klaeranlagen),
W74-09511 5D

Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

FILTRATION

Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

Speed Up Water Plants,
W74-09488 5D

Ultrafiltration Water Treatment,
W74-09636 5F

Chemical Addition to Trickling Filter Plants,
W74-09710 5D

Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

FINANCING

Rural Water System Designed for Suburban Use,
W74-09519 5F

University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

Pollution Control: New Method of Financing,
W74-09563 5G

FINLAND

Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

FIRN

Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

FISH

Fish Protective Regulations.
W74-09295 6E

Mercury Levels in Fish from Selected Wisconsin Waters (A Preliminary Report),
W74-09371 5A

Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

Mercury in Tunas: A Review,
W74-09574 5B

Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

FISH DIETS

Feeding and Growth of Young Bream at Spawning and Rearing Farms of the Volga Delta Under Stream-Flow Control Conditions, (In Russian),
W74-09313 8I

FISH FOOD

An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09723 2I

FISH MANAGEMENT

Fish Protective Regulations.
W74-09295 6E

FISH PARASITES

Philometra lusiana from Fishes of the Kremenchug Reservoir, USSR, (In Russian),
W74-09449 2H

Studies on Trematode Parasites of Luckow (India): I,
W74-09530 2I

On the Characterization of the Parasite Fauna of Yellow Perch (Perca fluviatilis L.) in Five Lakes, in Southern Ontario, Canada,
W74-09541 5B

FISH REARING

Feeding and Growth of Young Bream at Spawning and Rearing Farms of the Volga Delta Under Stream-Flow Control Conditions, (In Russian),
W74-09313 8I

FISHKILL

Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

FLOCCULATION

Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

FLOOD CONTROL

Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

FLOOD CONTROL

Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

River Regulations as Influence on Peak Discharge,
W74-09617 4A

Realization of the Danube Flood Protection Project for Vienna (Das Werden des Projektes fuer den Donauhochwasserschutz von Wien),
W74-09739 4A

FLOOD DAMAGE

Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

FLOOD DATA

Flood Plain Information; Pocotaligo River-Turkey Creek-Cane Savannah Creek-Green Swamp-Shot Pouch Creek-Rock Bluff Swamp, Sumter County, South Carolina.
W74-09355 4A

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

Flood Plain Information; Kit and Northeast Creeks; Research Triangle Area, Durham and Wake Counties, North Carolina.
W74-09357 4A

Flood Plain Information; Reedy River, Richland Creek, Greenville County, South Carolina.
W74-09358 4A

Recording Floods and Flood Damage,
W74-09397 4A

The Worth of Data in Hydrologic Design,
W74-09399 7C

FLOOD DISCHARGE

Rain Flood Discharge in Northeastern Slopes of Kopet-Dag (USSR), (In Russian),
W74-09365 4A

FLOOD FORECASTING

Design Criteria and Research Needs,
W74-09400 4A

FLOOD FREQUENCY

Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

Probability Distribution of Extreme Floods,
W74-09398 4A

FLOOD PLAIN ZONING

A Summary-Digest of Federal Water Laws and Programs,
W74-09318 6E

Ecological River Basin Management,
W74-09559 4A

FLOOD PLAINS

Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

FLOOD PROFILES

Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

Flood Plain Information; Reedy River, Richland Creek, Greenville County, South Carolina.
W74-09358 4A

FLOOD PROTECTION

Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

Realization of the Danube Flood Protection Project for Vienna (Das Werden des Projektes fuer den Donauhochwasserschutz von Wien),
W74-09739 4A

FLOOD RECURRENCE INTERVAL

Probability Distribution of Extreme Floods,
W74-09398 4A

FLOOD ROUTING

Comparison of Four Numerical Methods for Flood Routing,
W74-09621 2E

Desktop Computer Flow Routing,
W74-09626 8B

Multiple Linearization Flow Routing Model,
W74-09627 8B

FLOOD WAYS

Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

FLOODING (INTENTIONAL INUNDATION)

El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

FLOODS

Record of Two Jokullhlaups,
W74-09331 2C

Subglacial Leakage of Summit Lake, British Columbia, by Dye Determinations,
W74-09332 2C

Highways and the Catastrophic Floods of 1972.
W74-09390 2E

Floods of 1972,
W74-09391 2E

Weather Situations Associated with Floods During 1972,
W74-09392 2E

Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

Floods in Minnesota,
W74-09395 2E

Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

Probability Distribution of Extreme Floods,
W74-09398 4A

Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

Discharge Relations for Submerged Weirs,
W74-09481 8A

FLOODWATER

Regulation and Restriction of Location and Use of Structures in Regards to Runoff of Storm or Flood Waters.
W74-09293 6E

FLORIDA

Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

Beach and Shore Preservation Act.
W74-09297 6E

Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

FLOTATION

Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

FLOW CONTROL

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

The Cooper River Environmental Study.
W74-09379 2L

Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

Surface Water Hydraulics.
W74-09387 2L

Flow Smoothing in Sanitary Sewers,
W74-09471 5D

FLOW MEASUREMENT

Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

FLOW SMOOTHING BASINS
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

FLUOROMETRY
The Fluorometric Determination of Selenium: A Literature Review.
W74-09792 5A

FLY ASH
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

FOAMING
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

FOG
Results Generated from a One-Dimensional Warm Fog Model Which Simulates Hygroscopic Seeding,
W74-09322 3B

An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

FOOD PROCESSING INDUSTRY
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

FORCED DRYING
Undercage Drying of Laying Hen Manure,
W74-09678 5D

FORECASTING
Use of Decision Theory in Reservoir Operation,
W74-09478 4A

Some Historical Statistics Related to Future Standards,
W74-09505 5D

FORESTS
Energy Flux Studies in a Confierous Forest Ecosystem,
W74-09615 2D

FOSSIL FUELS
Comparing Effluent Releases From Nuclear and Fossilfueled Power Plants,
W74-09503 5B

FRANCE (GARONNE-ARIEGE RIVERS)
Water and Land Slides,
W74-09485 4A

FRANCE (NICE)
Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

FRASER RIVER (B
Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

FRESCON
Some Practical Aspects Concerning the Use of The Molluscicide N-Tritylmorpholine (Frescon) for the Control of Fascioliasis,
W74-09525 5C

FRESHWATER
Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

GAMMA RAYS
A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

GAMMARUS PSEUDOLIMNAEUS
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

GARBAGE DUMPS
Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

GAS CHROMATOGRAPHY
Pesticide Analysis in Water,
W74-09484 5A

GASES
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

GENETICS
Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

GEOCHEMISTRY
Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

GEOMORPHOLOGY
An Experimental Study of Drainage Basin Evolution and the Influence of Landforms on Hydrologic Variables,
W74-09586 4A

GEORGIA
Hydrographic Framework of the Doboy Sound Estuary and Surveys of the Other Tidal Inlets Along the Coast of Georgia,
W74-09582 2L

Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

GLACIERS
Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

Jerky Glacier Motion and Melt Water,
W74-09339 2C

Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

Hydrological Regime of Glaciers in the Alay Range, Central Asia,
W74-09346 2C

Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

GLACIERS (ARTIFICIAL)
On the Possibility of Artificial Control of the Mass Balance of a Perennial Snow Patch,
W74-09342 2C

GLACIOHYDROLOGY
Symposium on the Hydrology of Glaciers,
W74-09325 2C

The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

Glacier Discharge Simulation by Ground-Water Analogue,
W74-09327 2C

Analysis of the Run-Off and Flow Routing for a Mountain Glacier Basin,
W74-09328 2C

Water Movement Through the Gornergletscher,
W74-09329 2C

Variations in the Relation Between Glacier Discharge and Meteorological Elements,
W74-09330 2C

Record of Two Jokullhlaups,
W74-09331 2C

Subglacial Leakage of Summit Lake, British Columbia, by Dye Determinations,
W74-09332 2C

Some Viewpoints on the Internal Drainage of Glaciers,
W74-09333 2C

Geyser-Like Water Spouts at Werenskiold-breen, Spitsbergen,
W74-09334 2C

Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

Glacial Origin of Pro-Glacial Boulders,
W74-09336 2C

Hydrology of the Intergranular Veins in a Temperate Glacier,
W74-09337 2C

Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

Water at the Bed of a Glacier,
W74-09340 2C

Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

Influence of Changes in the Glacierzed Area on Summer Run-Off in the Porte Du Scex Drainage Basin of the Rhone,
W74-09344 2C

Hydrological Regime of Glaciers in the Alay Range, Central Asia,
W74-09346 2C

Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

GOVERNMENTAL INTERRELATIONS
Canals and Waterways.
W74-09290 6E

The Future of the Urban Habitat,
W74-09413 6E

Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

GRADUALLY VARIED FLOW
Simulation Accuracies of Gradually Varied Flow,
W74-09628 8B

GRASSES
Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

GREAR LAKES
Report on Great Lakes Water Quality for 1972.
W74-09257 5G

GREAT LAKES
International Field Year for the Great Lakes.
W74-09350 2H

International Field Work for the Great Lakes.
W74-09372 2H

Great Lakes Ice Cover, Winter 1971-72,
W74-09588 2C

GREAT LAKES REGION
Environmental Status of the Lake Michigan Region: Volume 7. Earthquake History and Measurement with Application to the Lake Michigan Drainage Basin,
W74-09407 2H

GREEN BAY (WIS)
Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

GREEN BAY (WISC)
Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

GREENLAND ICE SHEETS
Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

GROSS NATIONAL PRODUCT
Environmental Disruption: Implications for Economic Planning,
W74-09564 6B

GROSS NATIONAL WELFARE INDEX
Environmental Disruption: Implications for Economic Planning,
W74-09564 6B

GROUNDWATER
Ground-Water Data, 1972, Indian Wells Valley, California,
W74-09352 4B

Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

Iron Removal in Municipal Treatment Plants,
W74-09510 5D

(Water Well Contractor Survey).
W74-09529 4B

Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

Groundwater Quality. Door County, Wisconsin.
W74-09565 5B

Groundwater pollution.
W74-09590 5B

The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

Septic Tanks and Groundwater Pollution,
W74-09593 5B

Pollution of Groundwater by Salt Invasion,
W74-09594 5B

Groundwater Pollution by Agriculture,
W74-09595 5B

Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

Some Potential Environmental Problems from Population Explosion and Urban Development in Massachusetts and Adjacent Parts of New England,
W74-09598 5B

Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

Outline of the Hydrogeology of Siberia (Ocherki po gidrogeologii Sibiri).
W74-09641 2F

Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

GROUNDWATER FLOODING
Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

GROUNDWATER MOVEMENT
The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

Glacier Discharge Simulation by Ground-Water Analogue,
W74-09327 2C

Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

GROUNDWATER RECHARGE
Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

GROUNDWATER RESOURCES
Outline of the Hydrogeology of Siberia (Ocherki po gidrogeologii Sibiri).
W74-09641 2F

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

GROWTH RATES
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

Artificial Feeding of Carp Fry,
W74-09501 8I

Growth of Subirrigated Japanese Holly as Affected by Soil Type and Depth,
W74-09600 2I

GULF OF MEXICO
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

HAMPTON HARBOR (N
Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

HARBORS
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

A Bill to Amend the Outer Continental Shelf Lands Act and to Authorize the Secretary of the Interior to Regulate the Construction and Operation of Deepwater Port Facilities,
W74-09311 6E

HAWAII
Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

HEALTH EFFECTS
Health Effects of Environmental Pollutants,
W74-09547 5C

HEAT RECOVERY
Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

HEAVY METALS
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

State Standards for Mercury and Heavy Metals.
W74-09767 5G

Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

HEME SYNTHESIS
Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

HEPTANE
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

HERBICIDES
A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

HETEROTROPHIC BACTERIA
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

HIGHWAYS
Highways and the Catastrophic Floods of 1972.
W74-09390 2E

Design Criteria and Research Needs,
W74-09400 4A

HISTORIC FLOODS
Flood Damage in South Dakota,
W74-09394 2E

Floods in Minnesota,
W74-09395 2E

Probability Distribution of Extreme Floods,
W74-09398 4A

HOGS
Windrow Composting of Swine Wastes,
W74-09676 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

Treatment of Swine Wastes,
W74-09684 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

Treatment and Disposal of Swine Waste,
W74-09704 5D

Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

HOOGHOUDT'S METHOD
Experimental Field Studies Required for the Design of Drainages, (Studii experimentale in teren, necesare proiectarii drenajelor),
W74-09495 4A

HORSE FLY
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

HUMAN DISEASES
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

HUMAN HAIR
A Survey of Trace Metals in Human Hair,
W74-09573 5B

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

HUMAN PATHOLOGY
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

Lead Concentration Found in Human Blood in Association with Lead Colic,
W74-09764 5C

Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

Significance of Lead Isotope Composition in Blood,
W74-09772 5A

Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

Relation of Trace Metals to Human Health,
W74-09790 5C

HUMAN POPULATION
Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

HUMIDITY
Humidity Effects on Yield and Water Relations of Nine Crops,
W74-09796 3C

HURRICANE AGNES (1972)
Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

HURRICANES
Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

HYDRAULIC CONDUCTIVITY
Calculation of Soil Hydraulic Conductivity from Soil-Water Retention Relationships,
W74-09599 2G

HYDRAULIC MANURE TRANSPORT SYSTEMS
An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

HYDRAULIC MODELS
Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

An Experimental Study of Drainage Basin Evolution and the Influence of Landforms on Hydrologic Variables,
W74-09586 4A

HYDRAULICS
Symposium on the Hydrology of Glaciers,
W74-09325 2C

HYDROELECTRIC PLANTS
Replacement of the American Falls Dam in Idaho, Part 1.
W74-09309 6E

Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

HYDROGEN ION CONCENTRATION
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

HYDROGEOLOGY
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

Geohydrology of Crow Creek and Lower Brule Indian Reservations, South Dakota,
W74-09638 7C

Outline of the Hydrogeology of Siberia (Ocherki po gidrogeologii Sibiri).
W74-09641 2F

HYDROGEOLOGY

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

HYDROGRAPH ANALYSIS
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

HYDROLOGIC BUDGET
Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

HYDROLOGIC CYCLE
Water--A Primer,
W74-09613 2A

HYDROLOGIC DATA
Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

Recording Floods and Flood Damage,
W74-09397 4A

The Worth of Data in Hydrologic Design,
W74-09399 7C

Hydrologic Data Storage and Retrieval System,
W74-09401 7C

HYDROLOGY
Water--A Primer,
W74-09613 2A

HYGROSCOPIC SEEDING
Results Generated from a One-Dimensional Warm Fog Model Which Simulates Hygroscopic Seeding,
W74-09322 3B

ICE
Role of Ice Run-Off in the Water Balance of the Mountain Area of Central Asia,
W74-09345 2C

Road Salt, Drinking Water and Safety,
W74-09537 4C

ICE COVER
Great Lakes Ice Cover, Winter 1971-72,
W74-09588 2C

ICED LAKES
Great Lakes Ice Cover, Winter 1971-72,
W74-09588 2C

IDAHO
Replacement of the American Falls Dam in Idaho, Part 1.
W74-09309 6E

ILLINOIS
Air, Land and Water Pollution.
W74-09289 6E

Canals and Waterways.
W74-09290 6E

Soil and Water Conservation District Law.
W74-09291 6E

Drainage--Sewage Disposal; Contamination of Lake Michigan.
W74-09292 6E

Regulation and Restriction of Location and Use of Structures in Regards to Runoff of Storm or Flood Waters.
W74-09293 6E

Sanitary Districts.
W74-09294 6E

Fish Protective Regulations.
W74-09295 6E

A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

Subsurface Disposal of Pickle Liquor,
W74-09583 5E

IMPAIRED WATER USE
Reuse and Recycle of Water in Industry,
W74-09444 5D

Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

INBREEDING
Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

INCINERATION
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

INCRUSTATION
Operation and Maintenance of Wells,
W74-09524 8G

INDIA (KANPUR)
Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

INDIA (LUCKNOW)
Studies on Trematode Parasites of Luckow (India): I,
W74-09530 2I

INDIAN RESERVATIONS
U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

Geohydrology of Crow Creek and Lower Brule Indian Reservations, South Dakota,
W74-09638 7C

INDIAN WELLS VALLEY (CALIF)
Ground-Water Data, 1972, Indian Wells Valley, California,
W74-09352 4B

INDIANA
Subsurface Disposal of Pickle Liquor,
W74-09583 5E

Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

INDUSTRIAL PLANTS
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

INDUSTRIAL WASTES
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

State-of-the-Art of Waste Disposal in the Coatings Industry (As of June 1973),
W74-09506 5E

Capital Budgeting for Pollution Control,
W74-09558 5G

A Survey of Trace Metals in Human Hair,
W74-09573 5B

Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

INDUSTRIAL WATER
Reuse and Recycle of Water in Industry,
W74-09444 5D

Plating Pollution: The Latest From EPA, Part 1,
W74-09491 5B

INDUSTRIES
Pollution Control: New Method of Financing,
W74-09563 5G

INFILTRATION
Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

Calculation of Natural Catchment Infiltration by Computer,
W74-09367 7C

Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

Checking the Size of Sewerage Infiltration and Leaks Occurring Under Operating Conditions,

(Verificarea marimii infiltratiilor si exfiltratillor din canalizari in timpul exploatarii),
W74-09493 5D

INFORMATION EXCHANGE
Hydrologic Data Storage and Retrieval System,
W74-09401 7C

An Information System for the Management of Lake Ontario,
W74-09752 2H

INFORMATION RETRIEVAL
An Information System for the Management of Lake Ontario,
W74-09752 2H

INJECTION WELLS
Underground Injection of Wastewaters in the Ohio Valley Region.
W74-09324 5G

Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

Subsurface Disposal of Pickle Liquor,
W74-09583 5E

INJUNCTIVE RELIEF
Sedimentation Pollution Control Act of 1973.
W74-09303 6E

INSECT CONTROL
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

INSECTICIDES
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

INSECTS
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

INSTITUTIONAL ANALYSIS
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

INSTITUTIONAL CONSTRAINTS
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

INSTITUTIONS
University Research and Practice: An Institutional Confrontation,
W74-09421 6E

INSTRUMENTATION
Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

Underwater Television - Its Development and Future,
W74-09545 7B

Effect of Water Metering in USA.
W74-09553 6C

INTER-LABORATORY COMPARISONS
Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

INTERGRANULAR VEINS (GLACIAL)
Hydrology of the Intergranular Veins in a Temperate Glacier,
W74-09337 2C

INTERNAL DRAINAGE (GLACIERS)
Some Viewpoints on the Internal Drainage of Glaciers,
W74-09333 2C

INTERNATIONAL CONVENTION FOR PREVENTION OF THE POLLUTION OF THE SEA BY OIL
Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES
International Field Year for the Great Lakes.
W74-09350 2H

International Field Work for the Great Lakes.
W74-09372 2H

INTERNATIONAL HYDROLOGICAL DECADE
International Field Work for the Great Lakes.
W74-09372 2H

INTERNATIONAL JOINT COMMISSION
Report on Great Lakes Water Quality for 1972.
W74-09257 5G

INTERNATIONAL LAW
The East China Sea: The Role of International Law in the Settlement of Disputes.
W74-09286 6E

INTERNATIONAL WATERS
Offshore Shrimp Fisheries Act of 1973--Legislative History.
W74-09277 6E

The East China Sea: The Role of International Law in the Settlement of Disputes.
W74-09286 6E

INVESTIGATIONS
Outline of the Hydrogeology of Siberia (Ocherki po gidrogeologii Sibiri).
W74-09641 2F

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

ION EXCHANGE
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

IONS
Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

IOWA
Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

IOWA WATER POLLUTION CONTROL LAW
Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

IRAN
Drainage Investigations and Findings on the Gotvand Project - Iran,
W74-09797 2G

IRON
Selection of the Iron and Manganese Removal Procedures To Be Used in Small Water Treatment Plants, (Alegerea schemelor de deferizare si demanganizare a apei la statiile de tratare mici),
W74-09487 5D

Iron Removal in Municipal Treatment Plants,
W74-09510 5D

Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

IRON-55
55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

IRON COMPOUNDS
Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

IRON FILINGS
Magnetic Clarifier.
W74-09520 5D

IRRIGATION
Proceedings-Workshop on Land Disposal of Wastewaters.
W74-09422 5D

Land Application of Wastewater,
W74-09423 5D

Health Aspects of Land Application of Wastewater at Military Installations,
W74-09426 5D

Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

Growth of Subirrigated Japanese Holly as Affected by Soil Type and Depth,
W74-09600 2I

Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

IRRIGATION EFFICIENCY
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

IRRIGATION ENGINEERING
Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

IRRIGATION PRACTICES
Time It Right,
W74-09795 3F

Guidelines for Successful Center-Pivot Irrigation,
W74-09798 3F

More Production...Fewer Irrigations,
W74-09799 3F

Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

IRRIGATION PROGRAMS
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

Time It Right,
W74-09795 3F

More Production...Fewer Irrigations,
W74-09799 3F

ISOLATION
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

ISOTOPE STUDIES
Significance of Lead Isotope Composition in Blood,
W74-09772 5A

JAMES RIVER BASIN (VA
Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

JAPAN
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

JAPAN (HAMANA LAKE)
Surface Sediments in Hamana Lake, the Pacific Coast of Central Japan,
W74-09751 2H

JAPANESE HOLLY
Growth of Subirrigated Japanese Holly as Affected by Soil Type and Depth,
W74-09600 2I

JOINT TREATMENT
Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

JOINTS (CONNECTIONS)
Installation of Large-Diameter Fiber-Glass Flexible Pipe in Municipal Systems,
W74-09727 8A

Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

JOKULLHLAUPS
Record of Two Jokullhlaups,
W74-09331 2C

JUDICIAL DECISIONS
Reid V. El Paso Construction Co. (Damages for Alteration of Drainage Conditions).
W74-09296 6E

Montgomery V. Ellis (Action Seeking to Enjoin Stream Channelization).
W74-09299 6E

U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

Liability of Water Supplier for Damages Resulting from Furnishing Impure Water,
W74-09306 6E

JURISDICTION
The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

JUVENILE FISH
An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09723 2I

KALAMAZOO (MICH)
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

KANSAS
El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

KENNEBEC RIVER (MAINE)
The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

KENOSHA (WISC)
Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

KENTUCKY
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

KEPONE
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

KERN CO
Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

KINETICS
Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

KINGSTON (PENN)
Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

LABORATORY ANIMALS
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

LABORATORY TESTS
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

Granules Containing Lead in Isolated Mitochondria,
W74-09787 5C

LABRADOR (CANADA)
Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

LAGOONS
Oxidation and Aerated Lagoon Operation,
W74-09452 5D

Lagoons for Milking Center Wastes,
W74-09708 5D

LAKE BASINS
Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

LAKE CHAMPLAIN
Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

LAKE ERIE
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

LAKE (INFLOW)
Impermanent Lakes,
W74-09261 2H

LAKE JACOMO (MO)
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes

Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

LAKE MICHIGAN
Drainage--Sewage Disposal; Contamination of Lake Michigan.
W74-09292 6E

Environmental Status of the Lake Michigan Region: Volume 7. Earthquake History and Measurement with Application to the Lake Michigan Drainage Basin,
W74-09407 2H

Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

LAKE ONTARIO
International Field Work for the Great Lakes.
W74-09372 2H

Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

An Information System for the Management of Lake Ontario,
W74-09752 2H

LAKE SALLIE (MINN)
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

LAKE SEDIMENTS
Surface Sediments in Hamana Lake, the Pacific Coast of Central Japan,
W74-09751 2H

Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

LAKE WASHINGTON (WASH)
Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

LAKES
Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

LAND DEVELOPMENT
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

Conflicts in Land Use,
W74-09416 4A

Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

LAND DISPOSAL
Proceedings-Workshop on Land Disposal of Wastewaters.
W74-09422 5D

Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

Alternative Strategies for Managing Wastewater,
W74-09712 5D

LAND DISPOSAL (WASTES)
Land Application of Wastewater,
W74-09423 5D

Management of Lands Used for Waste Disposal,
W74-09424 5D

Wastewater and Soil Interaction,
W74-09425 5D

Health Aspects of Land Application of Wastewater at Military Installations,
W74-09426 5D

Economics of Alternative Wastewater Treatment Systems,
W74-09427 5D

Irrigation Cost for Land Disposal,
W74-09428 5D

Costs and Returns of Land Spreading Wastwater,
W74-09429 5D

Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

LAND MANAGEMENT
Environment: A New Focus for Land-Use Planning.
W74-09412 4A

Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

Management of Lands Used for Waste Disposal,
W74-09424 5D

Wastewater and Soil Interaction,
W74-09425 5D

Alternative Strategies for Managing Wastewater,
W74-09712 5D

LAND RECLAMATION
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

LAND SLIDES
Water and Land Slides,
W74-09485 4A

LAND USE
Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

The Effects of Land Use on Salmon Production,
W74-09411 4C

Environment: A New Focus for Land-Use Planning.
W74-09412 4A

Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

Conflicts in Land Use,
W74-09416 4A

Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

An Evaluation of the Impact of Land Use on Environmental Quality,
W74-09419 4A

Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

LANDFILLS
Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

LARVICIDES (MIDGES)
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

LASER RAMAN SPECTROSCOPY
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

LAW OF THE SEA
The East China Sea: The Role of International Law in the Settlement of Disputes.
W74-09286 6E

Seabed Mineral Resource Production and the Free Market,
W74-09287 6E

LEACHATE
Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

LEACHING
Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

LEAD
Chloride and Lead in Urban Snow,
W74-09468 5B

A Survey of Trace Metals in Human Hair,
W74-09573 5B

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of

Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

Significance of Lead Isotope Composition in Blood,
W74-09772 5A

Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

Granules Containing Lead in Isolated Mitochondria,
W74-09787 5C

Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

LEAD COLIC
Lead Concentration Found in Human Blood in Association with Lead Colic,
W74-09764 5C

LEAF-WATER POTENTIAL
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

LEASES
Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

LEGAL ASPECTS
Air, Land and Water Pollution.
W74-09289 6E

Drainage--Sewage Disposal; Contamination of Lake Michigan.
W74-09292 6E

Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

Liability of Water Supplier for Damages Resulting from Furnishing Impure Water,
W74-09306 6E

Proposed Wild and Scenic Chattooga River and the Conveyance of Certain Public Lands.
W74-09310 6E

Conflicts in Land Use,
W74-09416 4A

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

LEGEND LAKE (WISC)
The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

LEGISLATION
Environmental Statements--Engineer Regulations on Preparation and Coordination.
W74-09258 6E

Offshore Shrimp Fisheries Act of 1973--Legislative History.
W74-09277 6E

Air, Land and Water Pollution.
W74-09289 6E

Canals and Waterways.
W74-09290 6E

Soil and Water Conservation District Law.
W74-09291 6E

Drainage--Sewage Disposal; Contamination of Lake Michigan.
W74-09292 6E

Regulation and Restriction of Location and Use of Structures in Regards to Runoff of Storm or Flood Waters.
W74-09293 6E

Sanitary Districts.
W74-09294 6E

Fish Protective Regulations.
W74-09295 6E

Beach and Shore Preservation Act.
W74-09297 6E

Protection and Improvement of Waters: Pollution Control.
W74-09300 6E

Wetlands.
W74-09301 6E

U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

Sedimentation Pollution Control Act of 1973.
W74-09303 6E

Wild and Scenic Rivers Act Amendments Part 1.
W74-09307 6E

To Amend the Wild and Scenic Rivers Act.
W74-09308 6E

Replacement of the American Falls Dam in Idaho, Part 1.
W74-09309 6E

Proposed Wild and Scenic Chattooga River and the Conveyance of Certain Public Lands.
W74-09310 6E

A Bill to Amend the Outer Continental Shelf Lands Act and to Authorize the Secretary of the Interior to Regulate the Construction and Operation of Deepwater Port Facilities,
W74-09311 6E

A Bill to Amend the Oil Pollution Act, 1961 (75 Stat. 402), as Amended to Implement the 1969 and 1971 Amendments to the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, as Amended; and f or Other Purposes,
W74-09312 6E

A Bill to Assure that the Public is Provided with Safe Drinking Water, and for Other Purposes.
W74-09314 6E

Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

Recent Federal Legislation Significant in Environmental Planning Programs of the State of Texas.
W74-09316 6E

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

LETHAL LIMIT
Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

LEVEES
Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

LIGNINS
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

LIME
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

LIMESTONE
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

LIMNOLOGY
Structure and Inferred Circulation of South Cascade Lake, Washington, U.S.A.,
W74-09349 2C

International Field Year for the Great Lakes.
W74-09350 2H

LINER-INSERTING MACHINE
Liner Inserting Machine for Pipelines,
W74-09722 8C

LININGS
Liner Inserting Machine for Pipelines,
W74-09722 8C

Installation of Large-Diameter Fiber-Glass Flexible Pipe in Municipal Systems,
W74-09727 8A

LIQUID WASTES
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

LITHIUM
Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

LIVESTOCK
Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

LOADS (FORCES)
Snow Load Analysis and Recreational Uses of Snow Data,
W74-09610 2C

LOAM
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

LOS ANGELES COUNTY (CALIFORNIA)
Dewatering Digested Primary Sludge,
W74-09441 5D

LOUISIANA
Thibodaux Public Hearing Testimony.
W74-09288 6E

LOW-POROSITY PASTES
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

LUMBERING
The Effects of Land Use on Salmon Production,
W74-09411 4C

LYMNAEA-TRUNCATULA
Some Practical Aspects Concerning the Use of The Molluscicide N-Tritylmorpholine (Frescon) for the Control of Fascioliasis,
W74-09525 5C

MAGNESIUM
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

MAINE
Protection and Improvement of Waters: Pollution Control.
W74-09300 6E

The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

MAINTENANCE
'Pig' Brings Back Capacity,
W74-09516 8C

MAINTENANCE COSTS
O and M Costs: Pay Now or Pay Later,
W74-09533 4B

MAMMALS
Mercury and Other Metals in British Seals,
W74-09571 5B

MANAGEMENT
Environmental Hazards of Nuclear Wastes,
W74-09502 5B

Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

MANGANESE
Selection of the Iron and Manganese Removal Procedures To Be Used in Small Water Treatment Plants, (Alegerea schemelor de deferizare si demanganizare a apei la statiile de tratare mici),
W74-09487 5D

MANISTEE NATIONAL FOREST (MICH)
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

MAPS
Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

MARINE ANIMALS
Mercury and Other Metals in British Seals,
W74-09571 5B

MARINE FISH
The Commercial Feasibility of Rearing Pompano, Trachinotus carolinus (Linnaeus), in Cages,
W74-09566 8I

Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

MARION COUNTY (OHIO)
General Plan for Recommended Storm Drainage Facilities, Marion County, Ohio.
W74-09359 5D

MARSH PLANTS
Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

The Vegetation of the Cooper River Estuary,
W74-09383 2L

MARSHES
Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

The Vegetation of the Cooper River Estuary,
W74-09383 2L

MARYLAND
Wetlands.
W74-09301 6E

Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

MASS MEDIA
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

MASS TRANSFER
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

MASSACHUSETTS
Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

Speed Up Water Plants,
W74-09488 5D

Magnetic Clarifier.
W74-09520 5D

Some Potential Environmental Problems from Population Explosion and Urban Development in Massachusetts and Adjacent Parts of New England,
W74-09598 5B

Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

MATHEMATICAL MODELS
Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

Discharge Relations for Submerged Weirs,
W74-09481 8A

Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

Calibration of U.S. Geological Survey Rainfall/Runoff Model for Peak Flow Synthesis--Natural Basins,
W74-09603 2A

Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

MATHEMATICAL PROGRAMMING
Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

MATHEMATICAL STUDIES
Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

Checking the Size of Sewerage Infiltration and Leaks Occurring Under Operating Conditions, (Verificarea marimii infiltratiilor si exfiltratillor din canalizari in timpul exploatarii),
W74-09493 5D

Experimental Field Studies Required for the Design of Drainages, (Studii experimentale in teren, necesare proiectarii drenajelor),
W74-09495 4A

MEANDERS
Variation in Width-Discharge Relation and Some Implications for Hydraulic Geometry,
W74-09632 8B

MEASUREMENT
Pesticide Analysis in Water,
W74-09484 5A

Effect of Water Metering in USA.
W74-09553 6C

MELT WATER
Symposium on the Hydrology of Glaciers,
W74-09325 2C

The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

Glacier Discharge Simulation by Ground-Water Analogue,
W74-09327 2C

Variations in the Relation Between Glacier Discharge and Meteorological Elements,
W74-09330 2C

Some Viewpoints on the Internal Drainage of Glaciers,
W74-09333 2C

Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

Jerky Glacier Motion and Melt Water,
W74-09339 2C

Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

Influence of Changes in the Glacierzed Area on Summer Run-Off in the Porte Du Scex Drainage Basin of the Rhone,
W74-09344 2C

Role of Ice Run-Off in the Water Balance of the Mountain Area of Central Asia,
W74-09345 2C

Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

Structure and Inferred Circulation of South Cascade Lake, Washington, U.S.A.,
W74-09349 2C

MELTING
On the Possibility of Artificial Control of the Mass Balance of a Perennial Snow Patch,
W74-09342 2C

Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

MEMBRANE PROCESSES
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

Membrane Science and Technology.
W74-09633 5D

Low-Pressure Ultrafiltration Systems for Wastewater Contaminant Removal,
W74-09634 5D

Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

Ultrafiltration Water Treatment,
W74-09636 5F

Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

MEMBRANES
Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

Membrane Science and Technology.
W74-09633 5D

MENAI STRAITS
Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

MERCURIC SULFIDE
Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

MERCURY
Mercury Levels in Fish from Selected Wisconsin Waters (A Preliminary Report),
W74-09371 5A

Trace Metal Contaminants.
W74-09512 5A

Mercury and Other Metals in British Seals,
W74-09571 5B

A Survey of Trace Metals in Human Hair,
W74-09573 5B

Mercury in Tunas: A Review,
W74-09574 5B

Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

State Standards for Mercury and Heavy Metals.
W74-09767 5G

Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

METABOLISM
Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

METAL FINISHING WASTES
Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

METAL PIPES
Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

METALS
Trace Metal Contaminants.
W74-09512 5A

Mercury and Other Metals in British Seals,
W74-09571 5B

Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

Relation of Trace Metals to Human Health,
W74-09790 5C

METEOROLOGY
An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

METHODOLOGY
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

METHYL MERCURY
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

MICHIGAN
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

Aluminum Pit Doors Provide Easy Access to a Retention Basin.
W74-09515 5D

MICROSTRAINERS
Studies on the Suitability of Microstrainers for the Removal of Suspended Matter from Biological Clearing Facility Effluents (Untersuchungen ueber die Eignung des Mikrosiebes zur Entnahme suspendierter Stoffe aus den Ablaeufen biologischer Klaeranlagen),
W74-09511 5D

MIDGES
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

MIGRATION PATTERNS
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

MILITARY RESERVATIONS
Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

MILLICAN RESERVOIR (TEX)
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

MILLINGTON AND QUIRK EQUATION
Calculation of Soil Hydraulic Conductivity from Soil-Water Retention Relationships,
W74-09599 2G

MILWAUKEE (WISC)
Tunnels May Store Stormwater for Later Treatment.
W74-09749 5D

MINE ACIDS
Digging into Mine Waste.
W74-09531 5B

MINE DRAINAGE
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

MINE WASTES
Digging into Mine Waste.
W74-09531 5B

Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

MINE WATER
Digging into Mine Waste.
W74-09531 5B

MINERAL WATER
Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

Mineral Waters of Nilovaya Pustyn', Their Regime and Resources (Mineral'nyye vody Nilovoy Pustyni, ikh rezhim i resursy),
W74-09645 2K

Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

MINERALOGY
Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

MINNESOTA
Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

Floods in Minnesota,
W74-09395 2E

Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

MISSOURI
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

MIST IRRIGATION
The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

MITOCHONDRIA
Granules Containing Lead in Isolated Mitochondria,
W74-09787 5C

MODEL STUDIES
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

Stability and Control of Anaerobic Digestion,
W74-09434 5D

Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

An Experimental Study of Drainage Basin Evolution and the Influence of Landforms on Hydrologic Variables,
W74-09586 4A

Flood Runoff Systems with Collector Channel and Fast Discharge for Dams (Volgyzarogatak gyujtocsatornas, surrantos arapasztoi),
W74-09720 8A

Hydraulics of a Water Supply System with Fluctuating Water Demand, (Hydraulik eines Wasserversorgungssystems mit fluktuierenden Bedarfsmengen),
W74-09726 8B

Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

MODESTO-MERCED AREA (CALIF)
Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

MOISTURE CONTENT
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

MOLLUSCICIDES
Some Practical Aspects Concerning the Use of The Molluscicide N-Tritylmorpholine (Frescon) for the Control of Fascioliasis,
W74-09525 5C

MOLLUSKS
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

MONETARY BENEFITS
Speed Up Water Plants,
W74-09488 5D

MONITORING
Oxidation and Aerated Lagoon Operation,
W74-09452 5D

Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

Iron Removal in Municipal Treatment Plants,
W74-09510 5D

MONROEVILLE (PENN)
Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

MONTANA
Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

MORPHOLOGY
Impermanent Lakes,
W74-09261 2H

MOVEMENT
Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

Jerky Glacier Motion and Melt Water,
W74-09339 2C

MT
Subsurface Disposal of Pickle Liquor,
W74-09583 5E

MULTIPLE-PURPOSE PROJECTS
Sedimentation Pollution Control Act of 1973.
W74-09303 6E

MULTIPLE-PURPOSE RESERVOIRS
Use of Decision Theory in Reservoir Operation,
W74-09478 4A

MUNICIPAL REFUSE
Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

MUNICIPAL WASTES
Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

Flow Smoothing in Sanitary Sewers,
W74-09471 5D

Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

MUNICIPALITIES
Liability of Water Supplier for Damages Resulting from Furnishing Impure Water,
W74-09306 6E

MURDERKILL RIVER ESTUARY (DEL)
Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

MUSSLES
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

NAPLES (FLA)
Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

NARREN (MICH)
Aluminum Pit Doors Provide Easy Access to a Retention Basin.
W74-09515 5D

NATIONAL MILK PRODUCERS FEDERATION
Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

NATURAL DRAINAGE
Reid V. El Paso Construction Co. (Damages for Alteration of Drainage Conditions).
W74-09296 6E

NATURAL GAS
The Environmental Impact Concept, and Its Effect on the National Gas Industry,
W74-09489 5C

Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

NATURAL GAS INDUSTRY
The Environmental Impact Concept, and Its Effect on the National Gas Industry,
W74-09489 5C

NATURAL RESOURCES
Seabed Mineral Resource Production and the Free Market,
W74-09287 6E

Trace Metal Contaminants.
W74-09512 5A

NAVAJO LAKE (N
Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

NAVIGABLE WATERS
Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

NAVIGATION
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

NAVIGATION OBSTRUCTIONS
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

NEBRASKA
Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

NEUTRALIZATION
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

NEUTRON ACTIVATION ANALYSIS
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

NEW BEDFORD (MASS)
Speed Up Water Plants,
W74-09488 5D

NEW ENGLAND
Some Potential Environmental Problems from Population Explosion and Urban Development in Massachusetts and Adjacent Parts of New England,
W74-09598 5B

NEW HAMPSHIRE
Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Contamination of Waters.
W74-09304 6E

NEW JERSEY
Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

NEW MELONES LAKE (CALIF
New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

NEW MEXICO
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

NEW YORK
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

Sewage and Storms Get the Full Treatment,
W74-09499 5D

Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

Lagoons for Milking Center Wastes,
W74-09708 5D

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

NEW YORK BIGHT
An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

NEW YORK CITY
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

NEW YORK REGION
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

NEW ZEALAND
Calculation of Natural Catchment Infiltration by Computer,
W74-09367 7C

NEWARK BAY (N
Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

NICKEL
Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

NILE RIVER
Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

NITRATE NITROGEN
Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

NITRATES
A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

NITRILOTRIACETIC ACID
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

NITRITES
A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

NITROGEN
Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

NORTH CAROLINA
Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

Sedimentation Pollution Control Act of 1973.
W74-09303 6E

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

Flood Plain Information; Kit and Northeast Creeks; Research Triangle Area, Durham and Wake Counties, North Carolina.
W74-09357 4A

Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

NUCLEAR MOISTURE METERS
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

NUCLEAR POWER PLANT
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

NUCLEAR POWERPLANTS
Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

Comparing Effluent Releases From Nuclear and Fossilfueled Power Plants,
W74-09503 5B

NUCLEAR WASTES
Environmental Hazards of Nuclear Wastes,
W74-09502 5B

NUMERICAL ANALYSIS
Comparison of Four Numerical Methods for Flood Routing,
W74-09621 2E

Simulation Accuracies of Gradually Varied Flow,
W74-09628 8B

NUTRIENT POLLUTION
Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

NUTRIENT REMOVAL
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

NUTRIENTS
The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

OAHU (HI)
Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

OCEAN CIRCULATION
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

OCEAN CURRENTS
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

OCEANOGRAPHY
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

OCEANS
The East China Sea: The Role of International Law in the Settlement of Disputes.
W74-09286 6E

Seabed Mineral Resource Production and the Free Market,
W74-09287 6E

Chemical Descriptions of the Oceans,
W74-09570 5B

ODOR
Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

OHIO
General Plan for Recommended Storm Drainage Facilities, Marion County, Ohio.
W74-09359 5D

Rural Water System Designed for Suburban Use,
W74-09519 5F

Water Supply Improvement Project,
W74-09542 5B

University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

OHIO RIVER
Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

OHIO RIVER VALLEY
Underground Injection of Wastewaters in the Ohio Valley Region.
W74-09324 5G

OIL
A Bill to Amend the Outer Continental Shelf Lands Act and to Authorize the Secretary of the Interior to Regulate the Construction and Operation of Deepwater Port Facilities,
W74-09311 6E

A Bill to Amend the Oil Pollution Act, 1961 (75 Stat. 402), as Amended to Implement the 1969 and 1971 Amendments to the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, as Amended; and f or Other Purposes,
W74-09312 6E

OIL FIELDS
Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

OIL INDUSTRY
A Bill to Amend the Outer Continental Shelf Lands Act and to Authorize the Secretary of the Interior to Regulate the Construction and Operation of Deepwater Port Facilities,
W74-09311 6E

OIL POLLUTION
A Bill to Amend the Oil Pollution Act, 1961 (75 Stat. 402), as Amended to Implement the 1969 and 1971 Amendments to the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, as Amended; and f or Other Purposes,
W74-09312 6E

Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 3,
W74-09321 5G

Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

OIL POLLUTION ACT
Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

OIL SPILL BARRIERS
Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

OIL SPILLS
A Bill to Amend the Oil Pollution Act, 1961 (75 Stat. 402), as Amended to Implement the 1969 and 1971 Amendments to the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, as Amended; and f or Other Purposes,
W74-09312 6E

Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

U.S. Coast Guard Oil Pollution Investigation and Control School.
W74-09753 5G

OIL WASTES
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

OILY WATER
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 3,
W74-09321 5G

Vacuum Desorption Concept for Removing Oil from Water,
W74-09323 5G

Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

Disposal of Aircraft Washrack Waste Water,
W74-09376 5D

OKLAHOMA
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

ON-SITE TESTS
Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

ONTARIO (PHOSPHORUS DISCHARGE CONTROL)
Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

OPERATING COSTS
Costs and Returns of Land Spreading Wastwater,
W74-09429 5D

Dewatering Digested Primary Sludge,
W74-09441 5D

O and M Costs: Pay Now or Pay Later,
W74-09533 4B

OPERATION AND MAINTENANCE
Oxidation and Aerated Lagoon Operation,
W74-09452 5D

O and M Costs: Pay Now or Pay Later,
W74-09533 4B

OPERATIONS RESEARCH
The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

OPTIMIZATION
Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

OPTIMUM DEVELOPMENT PLANS
Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

ORGANIC COMPOUNDS
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

ORGANIC LOADING
Inroads to Activated Carbon Treatment,
W74-09461 5D

Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

ORGANIC MATTER
Heavy Metal Estimation in Biological Systems,
W74-09580 5B

Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

ORGANIZATIONS
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

ORYZIAS LATIPES
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

OUTBREEDING
Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

OUTFALL SEWERS
The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

OUTFALLS
Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

OUTLETS
The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

OVERFLOW
Discharge Relations for Submerged Weirs,
W74-09481 8A

Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

OVERLOADS
Stability and Control of Anaerobic Digestion,
W74-09434 5D

OWNERSHIP OF BEDS
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

OXIDATION
A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

OXIDATION DITCH
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

OXIDATION LAGOONS
Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

OXIDATION-REDUCTION POTENTIAL
Iron Removal in Municipal Treatment Plants,
W74-09510 5D

OXYGEN DEMAND
Report on 'In Situ' Benthic Respiration and Vertical Oxygen: Temperature Profiles.
W74-09384 5C

OXYGEN TRANSFER DATA
Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

OXYGENATION
Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

OZONE
Ozone: An Alternative to Chlorine,
W74-09714 5D

PACIFIC OCEAN
55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

PAINTS
Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

PALLADIUM
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

PATENTS
Apparatus for Treating Waste Fluids by Means of Dissolved Gases,
W74-09721 5D

Liner Inserting Machine for Pipelines,
W74-09722 8C

Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

Apparatus for Releasing Chemicals Clearing and Cleaning Waste Pipes,
W74-09725 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

Vacuum Sewage Conveying with Vacuum Operated Valve,
W74-09731 5D

Priming Unit for Distributing Priming Water to Multiple Sewer Line Water Traps,
W74-09732 5D

PATH OF POLLUTANTS
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

PATHOGENIC BACTERIA
Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

PATUXENT ESTUARY (MD)
Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

PEAK DISCHARGE
River Regulations as Influence on Peak Discharge,
W74-09617 4A

PENETRATION
Depth Prediction for Earth-Penetrating Projectiles,
W74-09534 8D

PENNSYLVANIA
Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

PERCOLATION
The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

PERMEABILITY
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

PERMITS
Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

PESTICIDES
Pesticide Analysis in Water,
W74-09484 5A

American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

PHENOLS
Inroads to Activated Carbon Treatment,
W74-09461 5D

PHILOMETRA-LUSIANA
Philometra lusiana from Fishes of the Kremenchug Reservoir, USSR, (In Russian),
W74-09449 2H

PHOSPHATES
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

PHOSPHORUS
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

PHOSPHORUS

Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

PHOSPHORUS COMPOUNDS

Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

PHOTOGRAPHY

Underwater Television - Its Development and Future,
W74-09545 7B

PHYSICAL-CHEMICAL TREATMENT

Alternative Strategies for Managing Wastewater,
W74-09712 5D

PHYTOPLANKTON

Content and Composition of Plant Pigments in the Rybinsk Reservoir (In Russian),
W74-09446 2H

PIGMENTS (PLANTS)

Content and Composition of Plant Pigments in the Rybinsk Reservoir (In Russian),
W74-09446 2H

PILOT PLANTS

Dewatering Digested Primary Sludge,
W74-09441 5D

Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

Selection of the Iron and Manganese Removal Procedures To Be Used in Small Water Treatment Plants, (Alegerea schemelor de deferizare si demanganizare a apei la statiile de tratare mici),
W74-09487 5D

Control of Biological Solids Concentration in Extended Aeration,
W74-09508 5D

Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

PIPELINES

Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

Flow Smoothing in Sanitary Sewers,
W74-09471 5D

Vacuum Sewage Conveying with Vacuum Operated Valve,
W74-09731 5D

PIPES

Liner Inserting Machine for Pipelines,
W74-09722 8C

Apparatus for Releasing Chemicals Clearing and Cleaning Waste Pipes,
W74-09725 5D

PLANKTON

Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

PLANNING

Sanitation and Public Health Planning,
W74-09317 5G

General Plan for Recommended Storm Drainage Facilities, Marion County, Ohio.
W74-09359 5D

Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

Ecological Concepts and Applications to Planning,
W74-09418 6B

An Evaluation of the Impact of Land Use on Environmental Quality,
W74-09419 4A

Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

Environmental Disruption: Implications for Economic Planning,
W74-09564 6B

Simulation Criteria for Selecting Wmter Resource System Alternatives,
W74-09567 6A

Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

PLANT BREEDING

Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

PLANT COMMUNITIES

Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

PLASTIC PAPER

How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

POLISHING PONDS

Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

POLLUTANT IDENTIFICATION

Laser Raman Spectroscopy of Solutes Dissolved in Water fro a Remote Platform,
W74-09255 5A

Pesticide Analysis in Water,
W74-09484 5A

Trace Metal Contaminants.
W74-09512 5A

Detection of Trace Metals in Water,
W74-09581 5A

A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

Significance of Lead Isotope Composition in Blood,
W74-09772 5A

Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

POLLUTANTS

Health Effects of Environmental Pollutants,
W74-09547 5C

POLLUTION

Fish Protective Regulations.
W74-09295 6E

POLLUTION ABATEMENT

Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Air, Land and Water Pollution.
W74-09289 6E

Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

Vacuum Desorption Concept for Removing Oil from Water,
W74-09323 5G

Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

Capital Budgeting for Pollution Control,
W74-09558 5G

Controlling Pollution by Price and Standard Systems: A General Equilibrium analysis,
W74-09561 5G

Pollution Control: New Method of Financing,
W74-09563 5G

Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

POLLUTION PREVENTION
To Amend the Wild and Scenic Rivers Act.
W74-09308 6E

POLLUTION TAXES (CHARGES)
Effluent Charges: A Critique,
W74-09560 5G

POLYELECTROLYTES
Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

POMPANO
The Commercial Feasibility of Rearing Pompano, Trachinotus carolinus (Linnaeus), in Cages,
W74-09566 8I

PORES
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

POROSITY
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

POROUS MEDIA
Hydrology of the Intergranular Veins in a Temperate Glacier,
W74-09337 2C

Influence of Suction and Blowing on Entrainment of Sand Particles,
W74-09616 2J

PORT VERDIGRIS (OKLA
Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

PORTALES (NM)
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

PORTUGAL
Sanitation and Public Health Planning,
W74-09317 5G

POTABLE WATER
Liability of Water Supplier for Damages Resulting from Furnishing Impure Water,
W74-09306 6E

A Bill to Assure that the Public is Provided with Safe Drinking Water, and for Other Purposes.
W74-09314 6E

Pesticide Analysis in Water,
W74-09484 5A

Road Salt, Drinking Water and Safety,
W74-09537 4C

Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

POTATOES
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

POTOMAC RIVER
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

POULTRY
Reduction in Moisture and Daily Removal of Wastes from Caged Laying Hens,
W74-09677 5D

Undercage Drying of Laying Hen Manure,
W74-09678 5D

Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

POWER SYSTEM OPERATION
Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

PRE-TREATMENT (WATER)
Speed Up Water Plants,
W74-09488 5D

PRECIPITATION GAGES
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

PREDICTION
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

PRESERVATION
Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

PRESSURE CHAMBER TECHNIQUE
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

PRICING
Effect of Water Metering in USA.
W74-09553 6C

PRIMARY PRODUCTIVITY
Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

PRIMING WATER
Priming Unit for Distributing Priming Water to Multiple Sewer Line Water Traps,
W74-09732 5D

PRO-GLACIAL BOULDERS
Glacial Origin of Pro-Glacial Boulders,
W74-09336 2C

PROBABILITY
Probability Distribution of Extreme Floods,
W74-09398 4A

PROBABILITY ASSESSMENT
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

PRODUCTION FUNCTIONS
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

PRODUCTIVITY
Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

Accelerated Growth in Agricultural Production and the Intersectoral Transfer of Resources,
W74-09550 3F

Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

PROJECT BENEFITS
Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

PROJECT PLANNING
Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

Montgomery V. Ellis (Action Seeking to Enjoin Stream Channelization).
W74-09299 6E

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

PROJECT POST-EVALUATION
Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

PROJECTILES
Depth Prediction for Earth-Penetrating Projectiles,
W74-09534 8D

PROJECTIONS
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

PROJECTS
Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

PROTEINS
Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

PROTEINURIA
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

PROXOPUR
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

PSEUDOMONAS AERUGINOSS
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

PUBLIC HEALTH
A Bill to Assure that the Public is Provided with Safe Drinking Water, and for Other Purposes.
W74-09314 6E

Sanitation and Public Health Planning,
W74-09317 5G

Health Aspects of Land Application of Wastewater at Military Installations,
W74-09426 5D

Health Effects of Environmental Pollutants,
W74-09547 5C

Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

Study of Arsenic Removal from Drinking Water,
W74-09776 5F

Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

Relation of Trace Metals to Human Health,
W74-09790 5C

Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

PUBLIC INVOLVEMENT
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

PUBLIC RELATIONS
Public Relations Aspects of Agricultural Waste Management,
W74-09666 5G

PUBLIC RIGHTS
U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

PUBLIC UTILITIES
Liability of Water Supplier for Damages Resulting from Furnishing Impure Water,
W74-09306 6E

PUERTO RICO
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

PULP AND PAPER INDUSTRY
Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

Paper Industry and Environmental Quality,
W74-09475 5D

Economic Impact of FWPCA Water Effluent Standards and Goals.
W74-09497 5D

Cost of Achieving E.P.A.'S BPCTCA and Zero Discharge.
W74-09748 5G

PULP WASTES
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwendung von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

Inroads to Activated Carbon Treatment,
W74-09461 5D

A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

PUMPING
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

PYROLYSIS
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

RADFORD (VA
Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

RADIATION
A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

RADIOACTIVE WASTE DISPOSAL
Environmental Hazards of Nuclear Wastes,
W74-09502 5B

RADIOACTIVITY
Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

RADIONUCLIDES
55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

RAINFALL INTENSITY
Rain Reservoirs and Rain Overflows (Regenbecken und Regenentlastungen),
W74-09509 4A

Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

RAINFALL-RUNOFF RELATIONSHIPS
Calculation of Natural Catchment Infiltration by Computer,
W74-09367 7C

Rain Reservoirs and Rain Overflows (Regenbecken und Regenentlastungen),
W74-09509 4A

Calibration of U.S. Geological Survey Rainfall/Runoff Model for Peak Flow Synthesis--Natural Basins,
W74-09603 2A

Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

RAPPAHANNOCK ESTUARY (VA)
Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

RATES OF APPLICATION
Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

RAYSTOWN LAKE (PA
Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

RECESSION CURVES
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

RECHARGE
Water-Table Fluctuation in Response to Recharge,
W74-09409 2F

RECIRCULATED WATER
Reuse and Recycle of Water in Industry,
W74-09444 5D

Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwendung von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

RECLAIMED WATER
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

Reuse and Recycle of Water in Industry,
W74-09444 5D

RECLAMATION
State-of-the-Art of Waste Disposal in the Coatings Industry (As of June 1973),
W74-09506 5E

RECOVERED PROTEIN
Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

RECREATION
Canals and Waterways.
W74-09290 6E

To Amend the Wild and Scenic Rivers Act.
W74-09308 6E

Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

Better Storm Drainage Facilities--At Lower Cost,
W74-09513 5D

The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

Groundwater Quality. Door County, Wisconsin.
W74-09565 5B

RECYCLING
Reuse and Recycle of Water in Industry,
W74-09444 5D

Paper Industry and Environmental Quality,
W74-09475 5D

Magnetic Clarifier.
W74-09520 5D

Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

Public Relations Aspects of Agricultural Waste Management,
W74-09666 5G

Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

REGIONAL FLOOD
Flood Plain Information; Pocotaligo River-Turkey Creek-Cane Savannah Creek-Green Swamp-Shot Pouch Creek-Rock Bluff Swamp, Sumter County, South Carolina.
W74-09355 4A

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

Flood Plain Information; Kit and Northeast Creeks; Research Triangle Area, Durham and Wake Counties, North Carolina.
W74-09357 4A

Flood Plain Information; Reedy River, Richland Creek, Greenville County, South Carolina.
W74-09358 4A

REGRESSION ANALYSIS
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

REGULATION
Cleaning Up: Paper Industry's Mess,
W74-09458 5G

River Regulations as Influence on Peak Discharge,
W74-09617 4A

Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

REGULATIONS
Waste Management Research.
W74-09663 5D

REMOTE SENSING
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

Snow Survey and Vegetation Growth in High Mountains (Swiss Alps),
W74-09320 2C

Underwater Television - Its Development and Future,
W74-09545 7B

REMOTE SENSING

Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

RESEARCH

University Research and Practice: An Institutional Confrontation,
W74-09421 6E

RESEARCH AND DEVELOPMENT

Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

RESEARCH NEEDS

Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

RESEARCH PRIORITIES

Environment: A New Focus for Land-Use Planning.
W74-09412 4A

Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

Conflicts in Land Use,
W74-09416 4A

Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

University Research and Practice: An Institutional Confrontation,
W74-09421 6E

Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

RESERVOIR OPERATION

Use of Decision Theory in Reservoir Operation,
W74-09478 4A

RESERVOIR STORAGE

Better Storm Drainage Facilities--At Lower Cost,
W74-09513 5D

Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

RESERVOIRS

El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

Canals and Waterways.
W74-09290 6E

River Regulations as Influence on Peak Discharge,
W74-09617 4A

RESINS

Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

RESOURCE ALLOCATION

Seabed Mineral Resource Production and the Free Market,
W74-09287 6E

RESPIRATION

Report on 'In Situ' Benthic Respiration and Vertical Oxygen: Temperature Profiles.
W74-09384 5C

RETENTION

Aluminum Pit Doors Provide Easy Access to a Retention Basin.
W74-09515 5D

RETURN FLOW

Proceedings-Workshop on Land Disposal of Wastewaters.
W74-09422 5D

REVERSE OSMOSIS

Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

REVIEWS

Mercury in Tunas: A Review,
W74-09574 5B

Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

The Fluorometric Determination of Selenium: A Literature Review.
W74-09792 5A

REYNOLDS NUMBER

Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

RHEOLOGY

Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

RHODE ISLAND

Small Town Spends a Big $8 Million,
W74-09711 5D

RIO BLANCO COUNTY (COLO)

Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

RIPARIAN RIGHTS

Wetlands.
W74-09301 6E

RISKS

Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

Environmental Status of the Lake Michigan Region: Volume 7. Earthquake History and Measurement with Application to the Lake Michigan Drainage Basin,
W74-09407 2H

Use of Decision Theory in Reservoir Operation,
W74-09478 4A

RIVER BASIN DEVELOPMENT

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

Ecological River Basin Management,
W74-09559 4A

RIVER BASINS

Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

RIVER FLOW

The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

RIVER REGULATION

Report of Proceedings Concerning the Reclassificatio- of Various Streams in North

Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

RIVERS
Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

To Amend the Wild and Scenic Rivers Act.
W74-09308 6E

Proposed Wild and Scenic Chattooga River and the Conveyance of Certain Public Lands.
W74-09310 6E

Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

RIVERS AND HARBORS ACT
Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

ROAD SALT
Road Salt, Drinking Water and Safety,
W74-09537 4C

ROCK CREEK (OHIO)
University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

ROCK MECHANICS
Fatigue Behavior of Rock,
W74-09523 8E

RODE TS
Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

RODENTS
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

Relation of Trace Metals to Human Health,
W74-09790 5C

ROOKERY BAY (FLA)
Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

ROUTING
Analysis of the Run-Off and Flow Routing for a Mountain Glacier Basin,
W74-09328 2C

Desktop Computer Flow Routing,
W74-09626 8B

Multiple Linearization Flow Routing Model,
W74-09627 8B

RUNOFF
Regulation and Restriction of Location and Use of Structures in Regards to Runoff of Storm or Flood Waters.
W74-09293 6E

Influence of Changes in the Glacierzed Area on Summer Run-Off in the Porte Du Scex Drainage Basin of the Rhone,
W74-09344 2C

Role of Ice Run-Off in the Water Balance of the Mountain Area of Central Asia,
W74-09345 2C

Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

RURAL AREAS
Rural Water System Designed for Suburban Use,
W74-09519 5F

O and M Costs: Pay Now or Pay Later,
W74-09533 4B

University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

Developments in the Treatment of Sewage from Small Communities.
W74-09743 5D

RURAL WATER SUPPLY
Beyond 'City Water': Rural Water System Design,
W74-09538 6B

SALINE WATER
Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

SALINE WATER INTRUSION
The Cooper River Environmental Study.
W74-09379 2L

Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

Surface Water Hydraulics.
W74-09387 2L

The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

Pollution of Groundwater by Salt Invasion,
W74-09594 5B

SALINITY
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

SALINITY CONTROL
Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

SALMON
The Effects of Land Use on Salmon Production,
W74-09411 4C

55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

SALT
Road Salt, Drinking Water and Safety,
W74-09537 4C

SALT LAKE CITY (UTAH)
Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

SALT TOLERANCE
Humidity Effects on Yield and Water Relations of Nine Crops,
W74-09796 3C

SAMPLING
Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

The Vegetation of the Cooper River Estuary,
W74-09383 2L

A Comparison of Techniques of Sampling the Arctic-Subarctic Snowpack in Alaska,
W74-09609 2C

SAN ANGELO (TEX)
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

SAN FRANCISCO BAY
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

SAN JOAQUIN VALLEY (CALIF)
Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

SAN JUAN MOUNTAINS (COLO)
Avalanche Studies in the San Juan Mountains of Southwestern Colorado,
W74-09607 2C

SAND BARS
Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

SANDSTONES
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

SANITARY ENGINEERING
How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

SANITARY LANDFILL SEALANTS
Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

SANITATION
Sanitation and Public Health Planning,
W74-09317 5G

SASKATCHEWAN RIVER (CANADA)
A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

SATELLITES (ARTIFICIAL)
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

SCENERY
Wild and Scenic Rivers Act Amendments Part 1.
W74-09307 6E

SEA WATER
Chemical Descriptions of the Oceans,
W74-09570 5B

SEALS
Mercury and Other Metals in British Seals,
W74-09571 5B

SEATTLE (WASH)
Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

SECONDARY POLLUTION
The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

SEDIMENT CONTROL
Sedimentation Pollution Control Act of 1973.
W74-09303 6E

SEDIMENT LOAD
Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

SEDIMENT TRANSPORT
Glacial Origin of Pro-Glacial Boulders,
W74-09336 2C

Tidal Currents, Sediment Transport, and Sand Banks in Chesapeake Bay Entrance, Virginia,
W74-09368 2L

Hydrographic Framework of the Doboy Sound Estuary and Surveys of the Other Tidal Inlets Along the Coast of Georgia,
W74-09582 2L

Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

Influence of Suction and Blowing on Entrainment of Sand Particles,
W74-09616 2J

Variation in Width-Discharge Relation and Some Implications for Hydraulic Geometry,
W74-09632 8B

SEDIMENT YIELD
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

SEDIMENTATION
Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

SEDIMENTS
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

SEEPAGE
Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

SEISMIC DESIGN
Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

SEISMIC STUDIES
Seismic Profiles, Cooper River.
W74-09388 2L

SELENIUM
The Fluorometric Determination of Selenium: A Literature Review.
W74-09792 5A

SEPARATED SEWERS
Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

SEPARATION TECHNIQUES
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 3,
W74-09321 5G

Vacuum Desorption Concept for Removing Oil from Water,
W74-09323 5G

Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

Studies on the Suitability of Microstrainers for the Removal of Suspended Matter from Biological Clearing Facility Effluents (Untersuchungen ueber die Eignung des Mikrosiebes zur Entnahme suspendierter Stoffe aus den Ablaeufen biologischer Klaeranlagen),
W74-09511 5D

Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

SEPTIC TANKS
Septic Tanks and Groundwater Pollution,
W74-09593 5B

Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

SETTLING BASINS
Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

SEWAGE
Vacuum Sewage Conveying with Vacuum Operated Valve,
W74-09731 5D

SEWAGE DISPOSAL
Vacuum Sewage Conveying with Vacuum Operated Valve,
W74-09731 5D

SEWAGE DISTRICTS
Sanitary Districts.
W74-09294 6E

SEWAGE LAGOONS
Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

SEWAGE SLUDGE
Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

SEWAGE TREATMENT
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

Economics of Alternative Wastewater Treatment Systems,
W74-09427 5D

Inroads to Activated Carbon Treatment,
W74-09461 5D

Sewage and Storms Get the Full Treatment,
W74-09499 5D

Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

Developments in the Treatment of Sewage from Small Communities.
W74-09743 5D

SEWERAGE
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

SEWERS
Checking the Size of Sewerage Infiltration and Leaks Occurring Under Operating Conditions, (Verificarea marimii infiltratiilor si exfiltratillor din canalizari in timpul exploatarii),
W74-09493 5D

How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

Apparatus for Releasing Chemicals Clearing and Cleaning Waste Pipes,
W74-09725 5D

Priming Unit for Distributing Priming Water to Multiple Sewer Line Water Traps,
W74-09732 5D

SHALLOW WELLS
Two Tests for the Cluster Well Concept,
W74-09549 8A

SHORE PROTECTION
Beach and Shore Preservation Act.
W74-09297 6E

SHRIMP
Offshore Shrimp Fisheries Act of 1973--Legislative History.
W74-09277 6E

SILICA
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

SILVER IODIDE
Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

SIMULATION ANALYSIS
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

Continuous Simulation Models in Urban Hydrology,
W74-09479 3D

Simulation Accuracies of Gradually Varied Flow,
W74-09628 8B

SIMULATION MODELS
Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

SIPHONS
How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

SLOPES
Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

SLUDGE DIGESTION
Stability and Control of Anaerobic Digestion,
W74-09434 5D

Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

SLUDGE DISPOSAL
Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

SLUDGE TREATMENT
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

Dewatering Digested Primary Sludge,
W74-09441 5D

Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

SLURRIES
Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

SNOW
Chloride and Lead in Urban Snow,
W74-09468 5B

SNOW COVER
Snow Survey and Vegetation Growth in High Mountains (Swiss Alps),
W74-09320 2C

SNOW LOADS
Snow Load Analysis and Recreational Uses of Snow Data,
W74-09610 2C

SNOW REMOVAL
Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

SNOW SURVEYS
Snow Sampling Techniques on a Small Subalpine Watershed,
W74-09608 2C

A Comparison of Techniques of Sampling the Arctic-Subarctic Snowpack in Alaska,
W74-09609 2C

Snow Load Analysis and Recreational Uses of Snow Data,
W74-09610 2C

SNOWFALL
Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

SNOWPACKS
On the Possibility of Artificial Control of the Mass Balance of a Perennial Snow Patch,
W74-09342 2C

Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

Avalanche Studies in the San Juan Mountains of Southwestern Colorado,
W74-09607 2C

Snow Sampling Techniques on a Small Subalpine Watershed,
W74-09608 2C

Evaporation Losses of Windblown Snow, and the Potential for Recovery,
W74-09611 2D

Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

SOCIAL PARTICIPATION
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

SOCIAL VALUES
Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

SODIUM CHLORIDE
Chloride and Lead in Urban Snow,
W74-09468 5B

Road Salt, Drinking Water and Safety,
W74-09537 4C

SODIUM SALTS
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

SOIL CONSERVATION
Soil and Water Conservation District Law.
W74-09291 6E

SOIL CONTAMINATION
Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

Agriculture in the Environment,
W74-09664 5D

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

SOIL DISPOSAL FIELDS
Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

SOIL INJECTION
Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

SOIL MANAGEMENT
The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

SOIL-MANURE PELLETS
Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

SOIL MECHANICS
Depth Prediction for Earth-Penetrating Projectiles,
W74-09534 8D

SOIL MICROBIOLOGY
Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

SOIL MOISTURE
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

SOIL ORGANISMS
Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

SOIL PROFILES
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

SOIL WATER MOVEMENT
Water Loss Estimates from a Fallow Soil,
W74-09546 2D

Calculation of Soil Hydraulic Conductivity from Soil-Water Retention Relationships,
W74-09599 2G

The Uniqueness of the Moisture Characteristics,
W74-09625 2G

SOLID WASTES
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

SOLVENT EXTRACTIONS
Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

SORGHUM
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

SOUTH AFRICA
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

SOUTH CAROLINA
Flood Plain Information; Pocotaligo River-Turkey Creek-Cane Savannah Creek-Green Swamp-Shot Pouch Creek-Rock Bluff Swamp, Sumter County, South Carolina.
W74-09355 4A

Flood Plain Information; Reedy River, Richland Creek, Greenville County, South Carolina.
W74-09358 4A

Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

The Cooper River Environmental Study.
W74-09379 2L

Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

Report on 'In Situ' Benthic Respiration and Vertical Oxygen: Temperature Profiles.
W74-09384 5C

Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

Charleston Area Sediment Samples,
W74-09386 5A

Surface Water Hydraulics.
W74-09387 2L

Seismic Profiles, Cooper River.
W74-09388 2L

Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

Two Tests for the Cluster Well Concept,
W74-09549 8A

SOUTH CASCADE GLACIER
The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

SOUTH DAKOTA
Flood Damage in South Dakota,
W74-09394 2E

Geohydrology of Crow Creek and Lower Brule Indian Reservations, South Dakota,
W74-09638 7C

SOUTHWEST U
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

SPARTINA ALTERNIFLORA
Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

SPAWNING
Feeding and Growth of Young Bream at Spawning and Rearing Farms of the Volga Delta Under Stream-Flow Control Conditions, (In Russian),
W74-09313 8I

SPECTROPHOTOMETRY
Detection of Trace Metals in Water,
W74-09581 5A

A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

SPECTROSCOPY
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

SPITSBERGEN
Geyser-Like Water Spouts at Werenskioldbreen, Spitsbergen,
W74-09334 2C

SPRINKLER IRRIGATION
Irrigation Cost for Land Disposal,
W74-09428 5D

Costs and Returns of Land Spreading Wastwater,
W74-09429 5D

Guidelines for Successful Center-Pivot Irrigation,
W74-09798 3F

STANDARDS
Plating Pollution: The Latest From EPA, Part 1,
W74-09491 5B

Some Historical Statistics Related to Future Standards,
W74-09505 5D

Controlling Pollution by Price and Standard Systems: A General Equilibrium analysis,
W74-09561 5G

State Standards for Mercury and Heavy Metals.
W74-09767 5G

STANDING CROPS
Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

STATISTICAL METHODS
An Objective Water Quality Index,
W74-09436 5G

Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

STOCHASTIC PROCESSES
Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

STORM DRAINS
General Plan for Recommended Storm Drainage Facilities, Marion County, Ohio.
W74-09359 5D

Aluminum Pit Doors Provide Easy Access to a Retention Basin.
W74-09515 5D

Tunnels May Store Stormwater for Later Treatment.
W74-09749 5D

STORM RUNOFF
Regulation and Restriction of Location and Use of Structures in Regards to Runoff of Storm or Flood Waters.
W74-09293 6E

Continuous Simulation Models in Urban Hydrology,
W74-09479 3D

Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

[redacted]
Cost,
W74-09513 5D

Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

Flood Runoff Systems with Collector Channel and Fast Discharge for Dams (Volgyzarogatak gyujtocsatornas, surrantos arapasztoi),
W74-09720 8A

STORM WATER
Sewage and Storms Get the Full Treatment,
W74-09499 5D

Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

STORM WATER RUNOFF
Tunnels May Store Stormwater for Later Treatment.
W74-09749 5D

STORM WATERS
Aluminum Pit Doors Provide Easy Access to a Retention Basin.
W74-09515 5D

STREAMFLOW
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

STREAMS
Montgomery V. Ellis (Action Seeking to Enjoin Stream Channelization).
W74-09299 6E

STRESS
Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

STRIP MINES
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

SUBLIMATION
Evaporation Losses of Windblown Snow, and the Potential for Recovery,
W74-09611 2D

SUBMERGED FLOW
Discharge Relations for Submerged Weirs,
W74-09481 8A

SUBMERGED LANDS
Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

SUBMERGED LANDS ACT
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

SUBSURFACE DISPOSAL
Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

SUBSURFACE DRAINAGE
Drainage Investigations and Findings on the [redacted] Project Drainage Facilities--At Lower
W74-09797 2G

SUBSURFACE FLOW
Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

SUBURBAN AREAS
The Future of the Urban Habitat,
W74-09413 6E

SUISUN BAY (CALIF)
The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

SULFITE LIQUORS
Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

SULFITE PULP MILLS
Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

SULFUR COMPOUNDS
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

SUNFISHES
Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

SURFACE DRAINAGE
Reid V. El Paso Construction Co. (Damages for Alteration of Drainage Conditions).
W74-09296 6E

Drainage Investigations and Findings on the Gotvand Project - Iran,
W74-09797 2G

SURFACE-GROUNDWATER RELATIONSHIPS
The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

SURFACE WATERS
El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

SURVEY
State-of-the-Art of Waste Disposal in the Coatings Industry (As of June 1973),
W74-09506 5E

SURVEYS
Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

(Water Well Contractor Survey).
W74-09529 4B

Great Lakes Ice Cover, Winter 1971-72,
W74-09588 2C

SUSPENDED LOAD
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

Apparatus for Treating Waste Fluids by Means of Dissolved Gases,
W74-09721 5D

Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

SUSPENDED SOLIDS
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

SUSQUEHANNA RIVER BASIN
Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

SWAMPS
Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

SWINE
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

SWINE WASTES
Windrow Composting of Swine Wastes,
W74-09676 5D

SWITZERLAND (GORNERGLETSCHER)
Water Movement Through the Gornergletscher,
W74-09329 2C

SWITZERLAND (RHONE RIVER)
Influence of Changes in the Glacierzed Area on Summer Run-Off in the Porte Du Scex Drainage Basin of the Rhone,
W74-09344 2C

SYSTEMS ANALYSIS
Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

Hydraulics of a Water Supply System with Fluctuating Water Demand, (Hydraulik eines Wasserversorgungssystems mit fluktuierenden Bedarfsmengen),
W74-09726 8B

TABANIDAE
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

TACOMA (WASH)
Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

TECTONIC LAKES
Impermanent Lakes,
W74-09261 2H

TELEMETRY
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

TEMPERATURE
Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

TENNESSEE
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

TERRACING
Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

TERTIARY TREATMENT
The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

Small Town Spends a Big $8 Million,
W74-09711 5D

TESTING PROCEDURES
The Fluorometric Determination of Selenium: A Literature Review.
W74-09792 5A

TESTS
Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

TETRACOTYLE-LALI
Studies on Trematode Parasites of Luckow (India): I,
W74-09530 2I

TEXAS
Reid V. El Paso Construction Co. (Damages for Alteration of Drainage Conditions).
W74-09296 6E

Recent Federal Legislation Significant in Environmental Planning Programs of the State of Texas.
W74-09316 6E

Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

A Survey of Trace Metals in Human Hair,
W74-09573 5B

Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

Significance of Lead Isotope Composition in Blood,
W74-09772 5A

Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

TEXAS COASTAL ZONE
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

THERMAL CONDITIONING
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

THERMAL POWERPLANTS
Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

THERMAL STRATIFICATION
Structure and Inferred Circulation of South Cascade Lake, Washington, U.S.A.,
W74-09349 2C

THICKENERS (DEWATERING FILTERS)
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

THRESHOLD LIMIT VALUE
Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

TILAPIA-MOSSAMBICA
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

TOXICITY
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

Trace Metal Contaminants.
W74-09512 5A

Mercury in Tunas: A Review,
W74-09574 5B

Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

TOXINS
Heavy Metal Estimation in Biological Systems,
W74-09580 5B

Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

Relation of Trace Metals to Human Health,
W74-09790 5C

TRACE ELEMENTS
Trace Metal Contaminants.
W74-09512 5A

Heavy Metal Estimation in Biological Systems,
W74-09580 5B

Detection of Trace Metals in Water,
W74-09581 5A

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

The Fluorometric Determination of Selenium: A Literature Review.
W74-09792 5A

TRACE METALS
Relation of Trace Metals to Human Health,
W74-09790 5C

TRACERS
Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

TRANS-ALASKA PIPELINE
Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

TRANSMISSIVITY
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

TRANSVAAL (LOSKOP DAM RESERVOIR)
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

TREATIES
U.S. V. Pollmann (Determination of Indian Lands under Lake).
W74-09302 6E

TREATMENT ALTERNATIVES
Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

TREATMENT FACILITIES
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

Sewage and Storms Get the Full Treatment,
W74-09499 5D

Some Historical Statistics Related to Future Standards,
W74-09505 5D

Better Storm Drainage Facilities--At Lower Cost,
W74-09513 5D

TREATMENT METHODS
Selection of the Iron and Manganese Removal Procedures To Be Used in Small Water Treatment Plants, (Alegerea schemelor de deferizare si demanganizare a apei la statiile de tratare mici),
W74-09487 5D

TREATMENT PLANTS
Developments in the Treatment of Sewage from Small Communities.
W74-09743 5D

TREMATODES
Studies on Trematode Parasites of Luckow (India): I,
W74-09530 2I

TRENCHES
Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

TRENT CANAL (ONTARIO)
The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

TRIBUTARIES
Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

TRICKLING FILTERS
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

TRINITROLOLUENE
Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

TRITIUM
Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

TROPICAL STORM AGNES
Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

TROUT
An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09723 2I

TUNA
Mercury in Tunas: A Review,
W74-09574 5B

TUNNELS
Tunnels May Store Stormwater for Later Treatment.
W74-09749 5D

TURBIDIMETER
Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

TURBIDITY
Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

TURBULENCE
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

ULTRAFILTRATION
Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

Ultrafiltration Water Treatment,
W74-09636 5F

UNDERGROUND STORAGE
Tunnels May Store Stormwater for Later Treatment.
W74-09749 5D

UNDERGROUND WASTE DISPOSAL
Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

UNDERWATER TELEVISION
Underwater Television - Its Development and Future,
W74-09545 7B

UNIT HYDROGRAPHS
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

UNITED KINGDOM
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

Effect of Water Metering in USA.
W74-09553 6C

Mercury and Other Metals in British Seals,
W74-09571 5B

Developments in the Treatment of Sewage from Small Communities.
W74-09743 5D

UNITED STATES
International Field Year for the Great Lakes.
W74-09350 2H

Floods of 1972,
W74-09391 2E

Weather Situations Associated with Floods During 1972,
W74-09392 2E

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Managing Water Resources: Basic Considerations and Problems,
W74-09734 6B

UNIVERSITIES
University Research and Practice: An Institutional Confrontation,
W74-09421 6E

UNSTEADY FLOW
The Uniqueness of the Moisture Characteristics,
W74-09625 2G

URBAN HYDROLOGY
Continuous Simulation Models in Urban Hydrology,
W74-09479 3D

Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

URBAN RUNOFF
Chloride and Lead in Urban Snow,
W74-09468 5B

Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

URBANIZATION
Environment: A New Focus for Land-Use Planning.
W74-09412 4A

The Future of the Urban Habitat,
W74-09413 6E

Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

URINE
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

USSR (ALAY RANGE)
Hydrological Regime of Glaciers in the Alay Range, Central Asia,
W74-09346 2C

USSR (BYELORUSSIA)
Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

USSR (CENTRAL ASIA)
Role of Ice Run-Off in the Water Balance of the Mountain Area of Central Asia,
W74-09345 2C

USSR (IRKUTSK OBLAST)
Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

USSR (KADAMDZHAY DEPOSIT)
Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

USSR (KOPET-DAG)
Rain Flood Discharge in Northeastern Slopes of Kopet-Dag (USSR), (In Russian),
W74-09365 4A

USSR (KREMENCHUG RESERVOIR)
Philometra lusiana from Fishes of the Kremenchug Reservoir, USSR, (In Russian),
W74-09449 2H

USSR (KUIBYSHEV RESERVOIR)
Benthophilus stellatus (Sauvage) in the Kuibyshev Reservoir (In Russian),
W74-09433 2H

USSR (LAKE BAYKAL)
Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

USSR (NILOVAYA PUSTYN')
Mineral Waters of Nilovaya Pustyn', Their Regime and Resources (Mineral'nyye vody Nilovoy Pustyni, ikh rezhim i resursy),
W74-09645 2K

USSR (RUZ RIVER RESERVOIR)
Formation of the Benthos of the Ruz Reservoir in the First Years of its Existence (1966-1967), (In Russian),
W74-09507 2H

USSR (RYBINSK RESERVOIR)
Content and Composition of Plant Pigments in the Rybinsk Reservoir (In Russian),
W74-09446 2H

USSR (SIBERIA)
Outline of the Hydrogeology of Siberia (Ocherki po gidrogeologii Sibiri).
W74-09641 2F

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

USSR (SYO-DARYA DELTA)
Dynamics of the Vegetation of the Sands of the Ancient and Present Delta of the Syr-Dar'ya River,
W74-09750 2I

USSR (TUVA ASSR)
Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

USSR (UKRAINE)
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

USSR (VOLGA DELTA)
Fish Rearing in the Rice Fields of the Volga Delta, (In Russian).,
W74-09284 8I

Feeding and Growth of Young Bream at Spawning and Rearing Farms of the Volga Delta Under Stream-Flow Control Conditions, (In Russian),
W74-09313 8I

UTAH
Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

UTILITY ASSESSMENT
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

VACUUM DESORPTION
Vacuum Desorption Concept for Removing Oil from Water,
W74-09323 5G

VACUUM SEWAGE CONVEYANCE
Vacuum Sewage Conveying with Vacuum Operated Valve,
W74-09731 5D

VANADIUM
A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

VANCOUVER (BC)
Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

VEGETATION
Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

The Vegetation of the Cooper River Estuary,
W74-09383 2L

Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

Dynamics of the Vegetation of the Sands of the Ancient and Present Delta of the Syr-Dar'ya River,
W74-09750 2I

VERMONT
Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

VIRGIN ISLANDS
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

VIRGINIA
Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

Tidal Currents, Sediment Transport, and Sand Banks in Chesapeake Bay Entrance, Virginia,
W74-09368 2L

Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

Two Tests for the Cluster Well Concept,
W74-09549 8A

Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

Optimal Design for Highway Drainage Culverts,
W74-09630 4A

Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

Chemical Addition to Trickling Filter Plants,
W74-09710 5D

VITAMINS
Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

WALES (SEVEN ESTUARY-BRISTOL CHANNEL)
Water Pollution Prevention in South Wales,
W74-09735 5G

WALNUT RIVER (KAN
El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

WASHINGTON
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

Public Water Supplies in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09640 7C

Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

WASHINGTON (D
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

WASHINGTON (SOUTH CASCADE LAKE)
Structure and Inferred Circulation of South Cascade Lake, Washington, U.S.A.,
W74-09349 2C

WASTE ASSIMILATIVE CAPACITY
Ecological Concepts and Applications to Planning,
W74-09418 6B

WASTE DISPOSAL
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

Management of Lands Used for Waste Disposal,
W74-09424 5D

Wastewater and Soil Interaction,
W74-09425 5D

Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

Agricultural Waste Management,
W74-09504 5D

State-of-the-Art of Waste Disposal in the Coatings Industry (As of June 1973),
W74-09506 5E

Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

Waste Management Research.
W74-09663 5D

Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

Dairy Manure Waste Handling Systems,
W74-09674 5D

Reduction in Moisture and Daily Removal of Wastes from Caged Laying Hens,
W74-09677 5D

Undercage Drying of Laying Hen Manure,
W74-09678 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

Treatment and Disposal of Swine Waste,
W74-09704 5D

Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

Apparatus for Treating Waste Fluids by Means of Dissolved Gases,
W74-09721 5D

WASTE DISPOSAL WELLS
Underground Injection of Wastewaters in the Ohio Valley Region.
W74-09324 5G

Subsurface Disposal of Pickle Liquor,
W74-09583 5E

WASTE DUMPS
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

WASTE HANDLING SYSTEMS
Dairy Manure Waste Handling Systems,
W74-09674 5D

WASTE MANAGEMENT
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

Waste Management Research.
W74-09663 5D

Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

WASTE MANAGEMENT ALTERNATIVES
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

WASTE MANAGEMENT RESEARCH
Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

WASTE MANAGEMENT SYSTEMS
Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

WASTE STORAGE
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

Agricultural Waste Management,
W74-09504 5D

Waste Management Research.
W74-09663 5D

Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

Lagoons for Milking Center Wastes,
W74-09708 5D

WASTE TREATMENT
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

Stability and Control of Anaerobic Digestion,
W74-09434 5D

Waste Management Research.
W74-09663 5D

Public Relations Aspects of Agricultural Waste Management,
W74-09666 5G

Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

Dairy Manure Waste Handling Systems,
W74-09674 5D

Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

Windrow Composting of Swine Wastes,
W74-09676 5D

Reduction in Moisture and Daily Removal of Wastes from Caged Laying Hens,
W74-09677 5D

Undercage Drying of Laying Hen Manure,
W74-09678 5D

Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

Treatment of Swine Wastes,
W74-09684 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

WASTE WATER DISPOSAL
Underground Injection of Wastewaters in the Ohio Valley Region.
W74-09324 5G

The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

Land Application of Wastewater,
W74-09423 5D

Management of Lands Used for Waste Disposal,
W74-09424 5D

Wastewater and Soil Interaction,
W74-09425 5D

Health Aspects of Land Application of Wastewater at Military Installations,
W74-09426 5D

Irrigation Cost for Land Disposal,
W74-09428 5D

Costs and Returns of Land Spreading Wastwater,
W74-09429 5D

Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

Water Pollution Prevention in South Wales,
W74-09735 5G

WASTE WATER (POLLUTION)
Contamination of Waters.
W74-09304 6E

WASTE WATER RECLAMATION
Reuse and Recycle of Water in Industry,
W74-09444 5D

WASTE WATER TREATMENT
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

Disposal of Aircraft Washrack Waste Water,
W74-09376 5D

Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

Proceedings-Workshop on Land Disposal of Wastewaters.
W74-09422 5D

Economics of Alternative Wastewater Treatment Systems,
W74-09427 5D

Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

Reuse and Recycle of Water in Industry,
W74-09444 5D

Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

Oxidation and Aerated Lagoon Operation,
W74-09452 5D

Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Ultrafiltration Sets Sail for New Process Services.
W74-09456 5D

Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

Inroads to Activated Carbon Treatment,
W74-09461 5D

A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

Paper Industry and Environmental Quality,
W74-09475 5D

The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

Selection of the Iron and Manganese Removal Procedures To Be Used in Small Water Treatment Plants, (Alegerea schemelor de deferizare si demanganizare a apei la statiile de tratare mici),
W74-09487 5D

Speed Up Water Plants,
W74-09488 5D

Plating Pollution: The Latest From EPA, Part 1,
W74-09491 5B

A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

Sewage and Storms Get the Full Treatment,
W74-09499 5D

Agricultural Waste Management,
W74-09504 5D

Rain Reservoirs and Rain Overflows (Regenbecken und Regenentlastungen),
W74-09509 4A

Iron Removal in Municipal Treatment Plants,
W74-09510 5D

Studies on the Suitability of Microstrainers for the Removal of Suspended Matter from Biological Clearing Facility Effluents (Untersuchungen ueber die Eignung des Mikrosiebes zur Entnahme suspendierter Stoffe aus den Ablaeufen biologischer Klaeranlagen),
W74-09511 5D

Magnetic Clarifier.
W74-09520 5D

The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

Membrane Science and Technology.
W74-09633 5D

Low-Pressure Ultrafiltration Systems for Wastewater Contaminant Removal,
W74-09634 5D

Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

Treatment and Disposal of Swine Waste,
W74-09704 5D

Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

Lagoons for Milking Center Wastes,
W74-09708 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

Chemical Addition to Trickling Filter Plants,
W74-09710 5D

Small Town Spends a Big $8 Million,
W74-09711 5D

Alternative Strategies for Managing Wastewater,
W74-09712 5D

A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

Ozone: An Alternative to Chlorine,
W74-09714 5D

Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

Apparatus for Treating Waste Fluids by Means of Dissolved Gases,
W74-09721 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

Developments in the Treatment of Sewage from Small Communities.
W74-09743 5D

Chemistry of Modern Water Chlorination. III. Disinfection by Chlorine. IV. Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

WATER ALLOCATION (POLICY)

A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

WATER ANALYSIS

Detection of Trace Metals in Water,
W74-09581 5A

Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

WATER BALANCE

On the Possibility of Artificial Control of the Mass Balance of a Perennial Snow Patch,
W74-09342 2C

Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

WATER-BORNE DISEASES

Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

WATER CHEMISTRY

Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

Mineral Waters of Nilovaya Pustyn', Their Regime and Resources (Mineral'nyye vody Nilovoy Pustyni, ikh rezhim i resursy),
W74-09645 2K

Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

WATER CIRCULATION

Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

WATER CONSERVATION

Principles and Standards for Planning Water and Related Land Resources (Final Environmental Statement).
W74-09279 4A

Soil and Water Conservation District Law.
W74-09291 6E

Water Resources-Powers of the Commissioner of Natural Resources.
W74-09298 6E

Contamination of Waters.
W74-09304 6E

A Summary-Digest of Federal Water Laws and Programs,
W74-09318 6E

Reuse and Recycle of Water in Industry,
W74-09444 5D

Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwendung von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Paper Industry and Environmental Quality,
W74-09475 5D

WATER CONSUMPTION

Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

WATER DEMAND

Hydraulics of a Water Supply System with Fluctuating Water Demand, (Hydraulik eines Wasserversorgungssystems mit fluktuierenden Bedarfsmengen),
W74-09726 8B

WATER DEVELOPMENT

Thibodaux Public Hearing Testimony.
W74-09288 6E

WATER DISTRIBUTION (APPLIED)

Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

WATER EQUIVALENT

Snow Sampling Techniques on a Small Subalpine Watershed,
W74-09608 2C

WATER HAMMER

Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

WATER LAW

Air, Land and Water Pollution.
W74-09289 6E

Proposed Wild and Scenic Chattooga River and the Conveyance of Certain Public Lands.
W74-09310 6E

WATER LEVEL FLUCTUATIONS

Water Movement Through the Gornergletscher,
W74-09329 2C

Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

Water-Table Fluctuation in Response to Recharge,
W74-09409 2F

Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

WATER LEVELS

Ground-Water Data, 1972, Indian Wells Valley, California,
W74-09352 4B

Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

WATER MANAGEMENT
Thibodaux Public Hearing Testimony.
W74-09288 6E

WATER MANAGEMENT (APPLIED)
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

Alternative Strategies for Managing Wastewater,
W74-09712 5D

Managing Water Resources: Basic Considerations and Problems,
W74-09734 6B

WATER MEASUREMENT
A General Purpose Event Water-Level Recorder,
W74-09604 7B

WATER PERMITS
Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

WATER POLICY
Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

Principles and Standards for Planning Water and Related Land Resources (Final Environmental Statement).
W74-09279 4A

Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

WATER POLLUTION
Clean Water--A Challenge to the Nation, Highlights and Recommendations of the National Conference on Water Pollution.
W74-09260 5G

Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

Contamination of Waters.
W74-09304 6E

Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

Chemical Descriptions of the Oceans,
W74-09570 5B

Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

Agriculture in the Environment,
W74-09664 5D

Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

Study of Arsenic Removal from Drinking Water,
W74-09776 5F

WATER POLLUTION CONTROL
Clean Water--A Challenge to the Nation, Highlights and Recommendations of the National Conference on Water Pollution.
W74-09260 5G

Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

Principles and Standards for Planning Water and Related Land Resources.
W74-09278 4A

Protection and Improvement of Waters: Pollution Control.
W74-09300 6E

The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

The Coastal Interceptor Waterway,
W74-09614 5G

Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

Water Pollution Prevention in South Wales,
W74-09735 5G

Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

WATER POLLUTION EFFECTS
The Effects of Land Use on Salmon Production,
W74-09411 4C

A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

WATER POLLUTION SOURCES
A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

Chloride and Lead in Urban Snow,
W74-09468 5B

Comparing Effluent Releases From Nuclear and Fossilfueled Power Plants,
W74-09503 5B

Groundwater pollution.
W74-09590 5B

The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

Coal Mining and Its Effect on Water Quality,
W74-09592 5B

WATER POLLUTION SOURCES

Septic Tanks and Groundwater Pollution,
W74-09593 5B

Groundwater Pollution by Agriculture,
W74-09595 5B

Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

Some Potential Environmental Problems from Population Explosion and Urban Development in Massachusetts and Adjacent Parts of New England,
W74-09598 5B

Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

WATER POLLUTION TREATMENT

Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

U.S. Coast Guard Oil Pollution Investigation and Control School.
W74-09753 5G

WATER PURIFICATION

Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

Study of Arsenic Removal from Drinking Water,
W74-09776 5F

WATER QUALITY

Report on Great Lakes Water Quality for 1972.
W74-09257 5G

Clean Water--A Challenge to the Nation, Highlights and Recommendations of the National Conference on Water Pollution.
W74-09260 5G

Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

Groundwater Quality, Door County, Wisconsin.
W74-09565 5B

Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

Mineral Waters of Nilovaya Pustyn', Their Regime and Resources (Mineral'nyye vody Nilovoy Pustyni, ikh rezhim i resursy),
W74-09645 2K

Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

WATER QUALITY ACT

Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

WATER QUALITY CONTROL

Clean Water--A Challenge to the Nation, Highlights and Recommendations of the National Conference on Water Pollution.
W74-09260 5G

Principles and Standards for Planning Water and Related Land Resources.
W74-09278 4A

Principles and Standards for Planning Water and Related Land Resources (Final Environmental Statement).
W74-09279 4A

Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

Oxidation and Aerated Lagoon Operation,
W74-09452 5D

WATER QUALITY INDEX

An Objective Water Quality Index,
W74-09436 5G

WATER QUALITY STANDARDS

An Objective Water Quality Index,
W74-09436 5G

Cleaning Up: Paper Industry's Mess,
W74-09458 5G

Some Historical Statistics Related to Future Standards,
W74-09505 5D

Trace Metal Contaminants.
W74-09512 5A

State Standards for Mercury and Heavy Metals.
W74-09767 5G

WATER RESOURCES

Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

Water Resources-Powers of the Commissioner of Natural Resources.
W74-09298 6E

Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

WATER RESOURCES DEVELOPMENT

Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

Principles and Standards for Planning Water and Related Land Resources.
W74-09278 4A

Principles and Standards for Planning Water and Related Land Resources (Final Environmental Statement).
W74-09279 4A

Protecting America's Estuaries: Florida (Part 2).
W74-09283 5G

Water Resources-Powers of the Commissioner of Natural Resources.
W74-09298 6E

A Summary-Digest of Federal Water Laws and Programs,
W74-09318 6E

Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

Managing Water Resources: Basic Considerations and Problems,
W74-09734 6B

WATER RESOURCES INSTITUTE

Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

WATER REUSE

Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

Land Application of Wastewater,
W74-09423 5D

Reuse and Recycle of Water in Industry,
W74-09444 5D

Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

WATER SPREADING

Water-Table Fluctuation in Response to Recharge,
W74-09409 2F

WATER STORAGE

Better Storm Drainage Facilities--At Lower Cost,
W74-09513 5D

WATER SUPPLY

Principles and Standards for Planning Water and Related Land Resources.
W74-09278 4A

Principles and Standards for Planning Water and Related Land Resources (Final Environmental Statement).
W74-09279 4A

Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

Water Resources-Powers of the Commissioner of Natural Resources.
W74-09298 6E

Contamination of Waters.
W74-09304 6E

'Pig' Brings Back Capacity,
W74-09516 8C

Beyond 'City Water': Rural Water System Design,
W74-09538 6B

Water Supply Improvement Project,
W74-09542 5B

University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

Public Water Supplies in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09640 7C

Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

WATER SUPPLY DEVELOPMENT

Rural Water System Designed for Suburban Use,
W74-09519 5F

Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

WATER TREATMENT

The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

Rural Water System Designed for Suburban Use,
W74-09519 5F

Membrane Science and Technology.
W74-09633 5D

Ultrafiltration Water Treatment,
W74-09636 5F

Small Town Spends a Big $8 Million,
W74-09711 5D

Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

WATER UTILIZATION

Water Problems in the Arid Western Regions of the USA, (In Russian),
W74-09469 4A

Plating Pollution: The Latest From EPA, Part 1,
W74-09491 5B

Effect of Water Metering in USA.
W74-09553 6C

Public Water Supplies in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09640 7C

Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

WATER WELLS

(Water Well Contractor Survey).
W74-09529 4B

Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

WATER WORKS

Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

WATER YIELD

Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

WATER ZONING

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

WATERSHED MANAGEMENT

Principles and Standards for Planning Water and Related Land Resources.
W74-09278 4A

To Amend the Wild and Scenic Rivers Act.
W74-09308 6E

A Summary-Digest of Federal Water Laws and Programs,
W74-09318 6E

WATERSHEDS (BASINS)

Rain Reservoirs and Rain Overflows (Regenbecken und Regenentlastungen),
W74-09509 4A

Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

WEATHER MODIFICATION
Results Generated from a One-Dimensional Warm Fog Model Which Simulates Hygroscopic Seeding,
W74-09322 3B

Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

WEIRS
Discharge Relations for Submerged Weirs,
W74-09481 8A

Flood Runoff Systems with Collector Channel and Fast Discharge for Dams (Volgyzarogatak gyujtocsatornas, surrantos arapasztoi),
W74-09720 8A

WELFARE (ECONOMICS)
Environmental Disruption: Implications for Economic Planning,
W74-09564 6B

WELL DATA
(Water Well Contractor Survey).
W74-09529 4B

WELLAND RIVER (ONT)
How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

WELLS
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

Operation and Maintenance of Wells,
W74-09524 8G

Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

Beyond 'City Water': Rural Water System Design,
W74-09538 6B

Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

Two Tests for the Cluster Well Concept,
W74-09549 8A

WEST VIRGINIA
Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

WESTERN U
Water Problems in the Arid Western Regions of the USA, (In Russian),
W74-09469 4A

WETLANDS
Wetlands.
W74-09301 6E

Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

WETTING
The Uniqueness of the Moisture Characteristics,
W74-09625 2G

WHEAT
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

WILD RIVER ACT
Wild and Scenic Rivers Act Amendments Part 1.
W74-09307 6E

WILD RIVERS ACT
To Amend the Wild and Scenic Rivers Act.
W74-09308 6E

WINNEPEG RIVER (CANADA)
Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

WINTER SPORTS
Snow Load Analysis and Recreational Uses of Snow Data,
W74-09610 2C

WISCONSIN
Mercury Levels in Fish from Selected Wisconsin Waters (A Preliminary Report),
W74-09371 5A

Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

Pioneering Plant Provides Cost-Saving Alternative to Separating Sewers.
W74-09490 5D

Groundwater Quality, Door County, Wisconsin.
W74-09565 5B

The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

Tunnels May Store Stormwater for Later Treatment.
W74-09749 5D

YELLOW PERCH
On the Characterization of the Parasite Fauna of Yellow Perch (Perca fluviatilis L.) in Five Lakes, in Southern Ontario, Canada,
W74-09541 5B

YUGOSLAVIA
Lead Concentration Found in Human Blood in Association with Lead Colic,
W74-09764 5C

YUGOSLAVIA (CROATIA)
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

YUKON RIVER (ALAS)
Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

ZINC
A Survey of Trace Metals in Human Hair,
W74-09573 5B

Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

ZONING
Regulation and Restriction of Location and Use of Structures in Regards to Runoff of Storm or Flood Waters.
W74-09293 6E

Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

ZOSTERA-MARINA
Surface Sediments in Hamana Lake, the Pacific Coast of Central Japan,
W74-09751 2H

AUTHOR INDEX

ABE, T.
Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

ACKERMAN, E. A.
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

ADAMS, J. B.
Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

ADKINS, T. R. JR.
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

AGAFONAVA, YE. G.
Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

AGENA, U.
Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

AGUADO, E.
Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

AHMAD, M. U.
Coal Mining and Its Effect on Water Quality,
W74-09592 5B

AKBAROV, A. A.
Hydrological Regime of Glaciers in the Alay Range, Central Asia,
W74-09346 2C

AKERS, J. P.
The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

ALBIN, R. C.
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

ALDRICH, R. H.
Pollution Control: New Method of Financing,
W74-09563 5G

ALVERSON, D. L.
Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

AMBACH, W.
Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

ANDERSON, D. F.
Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

ANDERSON, J. J.
Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

ANDERSON, W. A.
Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

ANDERSSON, A.
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

ANDREWS, J. F.
Stability and Control of Anaerobic Digestion,
W74-09434 5D

ANTHONY, J. M.
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

APPLEYARD, C. J.
Reuse and Recycle of Water in Industry,
W74-09444 5D

ARCENEAUX, W.
Operation and Maintenance of Wells,
W74-09524 8G

ARCHER, M. C.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

ARMSTRONG, R. L.
Avalanche Studies in the San Juan Mountains of Southwestern Colorado,
W74-09607 2C

ARTHUR, J. W.
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

ASHRY, M. M.
Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

ASSEL, R. A.
Great Lakes Ice Cover, Winter 1971-72,
W74-09588 2C

ASTAPOVA, N. I.
Fish Rearing in the Rice Fields of the Volga Delta, (In Russian).,
W74-09284 8I

ATTEWELL, P. B.
Fatigue Behavior of Rock,
W74-09523 8E

AUBERT, J.
Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

AUBERT, M.
Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

BACH, B.
Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwendung von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

BACHINSKI, V. P.
Philometra lusiana from Fishes of the Kremenchug Reservoir, USSR, (In Russian),
W74-09449 2H

BALDING, G. O.
Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

BALL, J. E.
Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

BANTA, R. L.
Ground-Water Data, 1972, Indian Wells Valley, California,
W74-09352 4B

BAPANAIAH, K. V.
A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

BARANOV, G. I.
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

BARANOWSKI, S.
Geyser-Like Water Spouts at Werenskioldbreen, Spitsbergen,
W74-09334 2C

BARKER, R. D.
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

BARR, J. R.
Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

BARTLETT, H. D.
Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

BARTOS, L. R.
Snow Sampling Techniques on a Small Subalpine Watershed,
W74-09608 2C

BASCO, R. DAVID
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

BATEMAN, T. W.
A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

BATSON, W. T.
Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

BATSON, W. T.

Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

BAYAZEED, A. F.
Subsurface Disposal of Pickle Liquor,
W74-09583 5E

BAZHEV, A. B.
Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

BELFORT, G.
Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

BELL, P. W. W.
Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

BERGDOLL, J. F.
Drying Poultry Manure and Refeeding the End Product,
W74-09686 5D

BERITIC, T.
Lead Concentration Found in Human Blood in Association with Lead Colic,
W74-09764 5C

BERTHOUEX, P. M.
Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

Some Historical Statistics Related to Future Standards,
W74-09505 5D

BEYROM, S. G.
Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

BIGBEE, P. D.
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

BISHOP, H. K.
Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

BLACK, J. R.
Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

BLACKMER, A.
Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

BLACKWELDER, B. C.
Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

BLITZ, E.
Checking the Size of Sewerage Infiltration and Leaks Occurring Under Operating Conditions. (Verificarea marimii infiltratiilor si exfiltratillor din canalizari in timpul exploatarii),
W74-09493 5D

BLUM, A.
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

BLUME, E. M.
Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

BOCKRATH, J. T.
Liability of Water Supplier for Damages Resulting from Furnishing Impure Water,
W74-09306 6E

BOGATKOV, N. M.
Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

BOOKER, D. R.
Project CUM II--Studies of the Rain Parameters of Randomly Seeded Warm and Cold Cumuli,
W74-09370 3B

BORISENKO, I. M.
Mineral Waters of Nilovaya Pustyn', Their Regime and Resources (Mineral'nyye vody Nilovoy Pustyni, ikh rezhim i resursy),
W74-09645 2K

BOULDIN, D. R.
Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

BOWER, B. T.
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

BOWSER, F. W.
Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

BOYLE, W. C.
Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

BRANDSTETTER, A.
Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

BRAUNSCHEIDEL, D. E.
Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

BRECHT, W.
Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

BREITTMAYER, J. P.
Study of the Diffusion of the Deep Sea Disposal of Residual Water,
W74-09472 5B

BRICKER, C. E.
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

BRINK, W. E.
Influence of Suction and Blowing on Entrainment of Sand Particles,
W74-09616 2J

BRITTON, J. D.
Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

BROUGHTON, R. S.
Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

BROWN, C. E.
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

BROWN, C. W.
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

BROWN, V. M.
Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

BRUNSDEN, D.
Impermanent Lakes,
W74-09261 2H

BUCHAN, S.
Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

BUCHET, J. P.
Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

BUCKLEY, J. L.
Agriculture in the Environment,
W74-09664 5D

BURLINGAME, A. L.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

BURNS, B. C.
Vacuum Sewage Conveying with Vacuum Operated Valve,
W74-09731 5D

BURNS, D. E.
Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

BURTON, D. R.
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

BUTCHBAKER, A. R.
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

BUYKOV, M. V.
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

CALLERY, R. L.
Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

CAMP, J. R.
Speed Up Water Plants,
W74-09488 5D

CAMPBELL, M. D.
O and M Costs: Pay Now or Pay Later,
W74-09533 4B

CAMPBELL, W. J.
The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

Structure and Inferred Circulation of South Cascade Lake, Washington, U.S.A.,
W74-09349 2C

CAPP, J. P.
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

CARLILE, B. L.
Wastewater and Soil Interaction,
W74-09425 5D

CARLSON, G. A.
Costs and Returns of Land Spreading Wastwater,
W74-09429 5D

CARRIGAN, P. H. JR.
Calibration of U.S. Geological Survey Rainfall/Runoff Model for Peak Flow Synthesis--Natural Basins,
W74-09603 2A

CASE, F. N.
A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

CEARLEY, J. E.
Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

CEMBROWICZ, R. G.
Hydraulics of a Water Supply System with Fluctuating Water Demand, (Hydraulik eines Wasserversorgungssystems mit fluktuierenden Bedarfsmengen),
W74-09726 8B

CHALIDZE, F. N.
Dynamics of the Vegetation of the Sands of the Ancient and Present Delta of the Syr-Dar'ya River,
W74-09750 2I

CHALMERS, R. K.
Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

CHARNELL, R. L.
An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

CHAUBE, S.
Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

CHENG, E. D. H.
Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

CHILDERS, J. M.
Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

CHILDREY, M. R.
Optimal Design for Highway Drainage Culverts,
W74-09630 4A

CHRISTENSEN, R. E.
Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

CHUBB, L. W.
A Hybrid Automatic Analyser,
W74-09622 5A

CLARKSON, T. W.
Excretion and Absorption of 0methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

CLEMENTS, M. S.
Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

CLICK, C. N.
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

CLINGER, R. C.
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

COATES, R. A.
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

COBB, E. L.
Two Tests for the Cluster Well Concept,
W74-09549 8A

COCKERHAM, P. W.
Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

COLEMAN, E. A.
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

COLEMAN, R. L.
Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,9750
W74-09492 5C

COLYER, D.
Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

CONNOR, L. J.
Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

COOKE, T. J.
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

COOPER, W. E.
Ecological Concepts and Applications to Planning,
W74-09418 6B

CORY, R. L.
Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

COULBOURN, W. C.
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

CRABB, P.
Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

CRAPPER, D. R.
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

CRAWFORD, N.
Continuous Simulation Models in Urban Hydrology,
W74-09479 3D

CRECELIUS, E. A.
Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

CRISP, D. J.
Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

CROCKER, W. C.
Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

CROKE, E. J.
An Evaluation of the Impact of Land Use on Environmental Quality,
W74-09419 4A

CRONSHAW, H.
Water Pollution Prevention in South Wales,
W74-09735 5G

CROOK, A. G.
A Comparison of Techniques of Sampling the Arctic-Subarctic Snowpack in Alaska,
W74-09609 2C

CROSSLAND, N. O.
Some Practical Aspects Concerning the Use of The Molluscicide N-Tritylmorpholine (Frescon) for the Control of Fascioliasis,
W74-09525 5C

CROWE, R.
Lagoons for Milking Center Wastes,
W74-09708 5D

D'ARGE, R. C.
Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

DALPKE, H-L.
Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

DALTON, A. J.
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

DANIELSON, J.
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

DARROW, D. K.
Relation of Trace Metals to Human Health,
W74-09790 5C

DAS, K. C.
Windrow Composting of Swine Wastes,
W74-09676 5D

DAULTON, J. D.
Water Supply Improvement Project,
W74-09542 5B

DAWDY, D. R.
The Worth of Data in Hydrologic Design,
W74-09399 7C

DE, A. K.
Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

DE MICHELE, E.
Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

DEAN, J. H.
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

DECKER, M. JR.
Windrow Composting of Swine Wastes,
W74-09676 5D

DEERING, R. W.
Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

DEGURSE, P. E.
Mercury Levels in Fish from Selected Wisconsin Waters (A Preliminary Report),
W74-09371 5A

DELL, B.
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

DERIKX, L.
Glacier Discharge Simulation by Ground-Water Analogue,
W74-09327 2C

DI GREGORIO, D. JR.
Ultrafiltration Water Treatment,
W74-09636 5F

DICKEY, J. W.
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

DOLL, R. J.
Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

DONALDSON, E. C.
Subsurface Disposal of Pickle Liquor,
W74-09583 5E

DOORNKAMP, J. C.
Impermanent Lakes,
W74-09261 2H

DORN, D. A.
The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

DU TOIT, P.
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

DUBBINK, D.
University Research and Practice: An Institutional Confrontation,
W74-09421 6E

DUBNER, B. H.
Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

DUNN, G. G.
Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

DUNSTAN, W. M.
Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

DURLEY, K. E.
The Effects of Land Use on Salmon Production,
W74-09411 4C

DYCK, R. G.
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

EADS, E. A.
A Survey of Trace Metals in Human Hair,
W74-09573 5B

EASTIN, J. D.
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

ECONOMOU, T. E.
Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

EDGAR, C. S.
Paper Industry and Environmental Quality,
W74-09475 5D

EDMINSTER, T. W.
Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

EDWARDS, W. M.
Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

EGAN, W. G.
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

EGLINTON, G.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

EISNER, H.
Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

EISNER, N. A.
Pollution Control: New Method of Financing,
W74-09563 5G

ELIZAROVA, V. A.
Content and Composition of Plant Pigments in the Rybinsk Reservoir (In Russian),
W74-09446 2H

ELLIS, B. G.
Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

ELLIS, D.
Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

ELLIS, J. R.
Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

ELLISTON, G. R.
Water Movement Through the Gornergletscher,
W74-09329 2C

EMDE, W. V. D.
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

ERICKSON, A. E.
Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

ERNSTROM, E. K.
Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

ETTER, E. R.
Oxidation and Aerated Lagoon Operation,
W74-09452 5D

EVANS, R. L.
A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

FARMER, I. W.
Fatigue Behavior of Rock,
W74-09523 8E

FAZZOLARE, R. A.
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

FERGUSON, T. L.
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

FERNANDO, G. H.
On the Characterization of the Parasite Fauna of Yellow Perch (Perca fluviatilis L.) in Five Lakes, in Southern Ontario, Canada,
W74-09541 5B

FIEHN, G.
Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

FILIP, A.
Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

FISHER, D.
Subglacial Leakage of Summit Lake, British Columbia, by Dye Determinations,
W74-09332 2C

FISK, S. D.
Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

FLECKSEDER, H.
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

FLEGAL, C. J.
The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

FLETCHER, A. W.
Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

FLOODGATE, G. D.
Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

FORBES, R. M.
Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

FOSSUM, G. O.
Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

FOSTER, J. E.
Beyond 'City Water': Rural Water System Design,
W74-09538 6B

FOX, S. V.
Design Criteria and Research Needs,
W74-09400 4A

FRANK, F. C.
Hydrology of the Intergranular Veins in a Temperate Glacier,
W74-09337 2C

FREEMAN, T. G.
A Comparison of Techniques of Sampling the Arctic-Subarctic Snowpack in Alaska,
W74-09609 2C

FREEZE, R. A.
Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

FRENCH, D. M.
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

FRENCH, M. C.
Mercury and Other Metals in British Seals,
W74-09571 5B

FRIEDMANN, J.
The Future of the Urban Habitat,
W74-09413 6E

FRIESEN, H. N.
Hydrologic Data Storage and Retrieval System,
W74-09401 7C

FROMMER, M.
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

FUECHSEL, R.
Possibilities for Reducing the Effluent Load of Sulfite Pulp Mills (Moeglichkeiten zur Behebung der Abwasserbelastung durch Sulfitzellstoffanlagen),
W74-09474 5D

FUHS, G. W.
Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

FUJII, T.
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

FURMAN, A. I.
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

GANDHI, H. S.
Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

GANLEY, R. J.
Sewage and Storms Get the Full Treatment,
W74-09499 5D

GANUS, W. J.
Problems Related to the Evaluation of Groundwater Resources of the Crystalline Rock Area, San Diego County, California,
W74-09544 2F

GARDNER, R. A.
Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

GARNER, W.
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

GARTON, J. E.
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

GAUDY JR, A. F.
Control of Biological Solids Concentration in Extended Aeration,
W74-09508 5D

GAVLENA, F. K.
Benthophilus stellatus (Sauvage) in the Kuibyshev Reservoir (In Russian),
W74-09433 2H

GAY, L. W.
Energy Flux Studies in a Confierous Forest Ecosystem,
W74-09615 2D

GEHLBACH, A. E.
Operational Problems of Pork Production Related to Environmental Quality,
W74-09683 5D

GEORGE, T. A.
Snow Load Analysis and Recreational Uses of Snow Data,
W74-09610 2C

GHOSH, S.
Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

GIBBS, C. F.
An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

GIBNEY, L. C.
Inroads to Activated Carbon Treatment,
W74-09461 5D

GIBSON, H. E.
Charleston Area Sediment Samples,
W74-09386 5A

GILBERSTON, C. B.
Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

GILBERTSON, C. B.
Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

GISH, C. D.
Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

GLASSON, H. H.
'Pig' Brings Back Capacity,
W74-09516 8C

GLEISBERG, D.
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

GLENNON, J. P.
Health Aspects of Land Application of Wastewater at Military Installations,
W74-09426 5D

GLUSKOTER, H. J.
Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

GOLDBERG, E. D.
Chemical Descriptions of the Oceans,
W74-09570 5B

GOLDBLATT, P. J.
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

GOLDSTEIN, S. N.
O and M Costs: Pay Now or Pay Later,
W74-09533 4B

GOLDTHWAIT, R. P.
Jerky Glacier Motion and Melt Water,
W74-09339 2C

GOLLAN, A.
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

GOLUBEV, G. N.
Analysis of the Run-Off and Flow Routing for a Mountain Glacier Basin,
W74-09328 2C

GOMONENKO, N. F.
Philometra lusiana from Fishes of the Kremenchug Reservoir, USSR, (In Russian),
W74-09449 2H

GOOCH, C. H.
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

GOODMAN, B. L.
Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

GORDON, A. R.
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

GOSWAMI, S. R.
Iron Removal in Municipal Treatment Plants,
W74-09510 5D

GRAEF, S. P.
Stability and Control of Anaerobic Digestion,
W74-09434 5D

GRAHAM, D. B.
Public Relations Aspects of Agricultural Waste Management,
W74-09666 5G

GRANT, R. A.
Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

GREENBERG, A. E.
Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

GREENBERG, M. R.
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

GREGORY, L. A.
Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

GREGORY, R. W.
The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

GRIEK, M. R.
River Regulations as Influence on Peak Discharge,
W74-09617 4A

GRIFFING, T. C.
Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

GRIMM, A.
Dairy Manure Waste Handling Systems,
W74-09674 5D

GRIN, A. M.
Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

GROWITZ, D. J.
Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

GRUB, W.
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

GRZYWIENSKI, A.
Realization of the Danube Flood Protection Project for Vienna (Das Werden des Projektes fuer den Donauhochwasserschutz von Wien),
W74-09739 4A

GULLEDGE, J. H.
Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

HABASHY, A. P.
Artificial Feeding of Carp Fry,
W74-09501 8I

HAEFNER, H.
Snow Survey and Vegetation Growth in High Mountains (Swiss Alps),
W74-09320 2C

HAGAN, R. M.
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

HAGEN, V.
Design Criteria and Research Needs,
W74-09400 4A

HAGERTY, D. J.
Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

HAHNE, H. C. H.
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

HALLIGAN, B. J.
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

HANDA, T.
Surface Sediments in Hamana Lake, the Pacific Coast of Central Japan,
W74-09751 2H

HANISCH, B.
Studies on the Suitability of Microstrainers for the Removal of Suspended Matter from Biological Clearing Facility Effluents (Untersuchungen ueber die Eignung des Mikrosiebes zur Entnahme suspendierter Stoffe aus den Ablaeufen biologischer Klaeranlagen),
W74-09511 5D

HANNA, K. M.
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

HANSEN, C. M.
Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

HANSEN, E. A.
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

HARDISON, C. H.
Probability Distribution of Extreme Floods,
W74-09398 4A

HARKINS, R. D.
An Objective Water Quality Index,
W74-09436 5G

HARRIS, A. J.
Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

HARRISON, L. J.
Flood Damage in South Dakota,
W74-09394 2E

HASHIMOTO, A. G.
Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

HAYASHI, S. T.
Dewatering Digested Primary Sludge,
W74-09441 5D

HAZEN, T. E.
Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

HEALD, E. J.
The Coastal Interceptor Waterway,
W74-09614 5G

HEASLIP, G. B.
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

HEEPS, D. P.
Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

HEGG, R. O.
Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

HEISLER, E. G.
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

HEPPLESTON, P. B.
Mercury and Other Metals in British Seals,
W74-09571 5B

HESLER, J. C.
Treatment and Disposal of Swine Waste,
W74-09704 5D

HESSEL, D. L.
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

HICKEMAN, R. E.
Small Town Spends a Big $8 Million,
W74-09711 5D

HIGGINS, R. B.
Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

HIGUCHI, K.
On the Possibility of Artificial Control of the Mass Balance of a Perennial Snow Patch,
W74-09342 2C

HILER, E. A.
Time It Right,
W74-09795 3F

HILL, D. M.
Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

HILL, M. E.
Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

HIMMELBLAU, D. M.
Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

HINESLY, T. D.
The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

HOBBS, N.
Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

HOFFMAN, G. J.
Humidity Effects on Yield and Water Relations of Nine Crops,
W74-09796 3C

HOFFMAN, J. I.
The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

HOFMANN, W.
Design Criteria and Research Needs,
W74-09400 4A

Recording Floods and Flood Damage,
W74-09397 4A

HOGLUND, C. R.
Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

HOLLOWELL, J. R.
Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

HOLLYDAY, E. F.
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

HOLMES, C. W.
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

HORTON, M. L.
Water Loss Estimates from a Fallow Soil,
W74-09546 2D

HOUSLEY, J. G.
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

HOUSTON, C. W.
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

HOWARD, F. B.
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

HOWE, R. S.
Alternative Strategies for Managing Wastewater,
W74-09712 5D

HOWELLS, D. H.
Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

HOWELLS, L. W.
Geohydrology of Crow Creek and Lower Brule Indian Reservations, South Dakota,
W74-09638 7C

HUBER, L.
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

HUDSON, R. Y.
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

HUGGINS, A. F.
River Regulations as Influence on Peak Discharge,
W74-09617 4A

HUISINGH, D.
Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

HULL, A. P.
Comparing Effluent Releases From Nuclear and Fossilfueled Power Plants,
W74-09503 5B

HUMENICK, M. J.
Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

HUMENIK, F. J.
Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

HUMMEL, J. W.
Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

HURLEY, J. T.
Pesticide Analysis in Water,
W74-09484 5A

HURST, A. W.
Calculation of Natural Catchment Infiltration by Computer,
W74-09367 7C

HURST, G. E.
Apparatus for Treating Waste Fluids by Means of Dissolved Gases,
W74-09721 5D

HUSOCK, B.
Fundamentals of Cathodic Protection,
W74-09548 8G

HUTCHISON, R. M.
Installation of Large-Diameter Fiber-Glass Flexible Pipe in Municipal Systems,
W74-09727 8A

HYDER, C. L.
Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

IKEN, A.
Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

IMAN, A. E.
Artificial Feeding of Carp Fry,
W74-09501 8I

ISOM, B. G.
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

ITOKAWA, Y.
Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

IVANILOVA, R. F.
Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

IVANOV, V. P.
Fish Rearing in the Rice Fields of the Volga Delta, (In Russian).,
W74-09284 8I

JAAKSON, R.
The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

JACKSON, R. A.
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

JACOBS, L. W.
Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

JACOBSEN, P.
Drainage Investigations and Findings on the Gotvand Project - Iran,
W74-09797 2G

JENKINS, C. E.
55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

JENSEN, M. E.
Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

JOBSON, H. E.
Stochastic Analysis of Dune Bed Profiles,
W74-09619 2J

JOHNSON, F. L.
Design Criteria and Research Needs,
W74-09400 4A

JOHNSON, G. N.
Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

JOHNSON, H. E.
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

JOHNSON, J. B.
Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

JOHNSON, J. T.
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

JOHNSON, P. W.
Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

JOLLY, J. P.
Simulation Accuracies of Gradually Varied Flow,
W74-09628 8B

JONES, C. C.
Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

JONES, P. H.
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

JOSEPHSON, J.
Cleaning Up: Paper Industry's Mess,
W74-09458 5G

JUDY, J. N.
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

KABEYA, H.
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

KADABA, M. P.
Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

KANDLER, J.
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

KAO, R. L. C.
Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

KAPPE, D. S.
Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

KARCZMARCZYK, S.
Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

KASHEF, A.-A. I.
Pollution of Groundwater by Salt Invasion,
W74-09594 5B

KASSER, P.
Influence of Changes in the Glacierzed Area on Summer Run-Off in the Porte Du Scex Drainage Basin of the Rhone,
W74-09344 2C

KAUROV, V. F.
Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

KAWAHATA, M.
Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

KEEFER, T. N.
Desktop Computer Flow Routing,
W74-09626 8B

Multiple Linearization Flow Routing Model,
W74-09627 8B

KEENER, R. B.
Environmental Status of the Lake Michigan Region: Volume 7. Earthquake History and Measurement with Application to the Lake Michigan Drainage Basin,
W74-09407 2H

KEENEY, D. R.
Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

KENNEDY, J. R.
Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

KERBER, J. D.
Detection of Trace Metals in Water,
W74-09581 5A

KETCHEN, E. E.
A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

KETCHUM, L. H. JR.
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

KHAN, F.
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

KILLIAN, E. W.
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

KIMURA, M.
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

KIMURA, Y.
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

KING, L. G.
Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

KING, P. H.
Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

KINGSLEY, F. H.
Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

KIRSTA, B. T.
Rain Flood Discharge in Northeastern Slopes of Kopet-Dag (USSR), (In Russian),
W74-09365 4A

KISER, K.
Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

KJELLSTROM, T.
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

KLAUSNER, S. D.
Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

KLAWE, W. L.
Mercury in Tunas: A Review,
W74-09574 5B

KLEIN, D. A.
Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

KLEINERT, S. J.
Mercury Levels in Fish from Selected Wisconsin Waters (A Preliminary Report),
W74-09371 5A

KNIGHT, M. C.
Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

KNIGHTON, D.
Variation in Width-Discharge Relation and Some Implications for Hydraulic Geometry,
W74-09632 8B

KOCMOND, W. C.
An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

KOELLIKER, J. K.
Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

KONDO, R.
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

KONDO, T.
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

KORNIYENKO, YE. YE.
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

KOS, D. E.
Water Supply Improvement Project,
W74-09542 5B

KOTHANDARAMAN, V.
A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

KREHER, H. J.
Operational Problems of Poultry Production Related to Environmental Quality,
W74-09689 5D

KRESKE, W. J.
Speed Up Water Plants,
W74-09488 5D

KRISHNAN, S. S.
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

KRIZ, G. J.
Groundwater Pollution by Agriculture,
W74-09595 5B

KROONTJE, W.
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

KRULICK, S.
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

KRUTIKOVA, A. I.
Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

KUBOTA, J.
Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

KUO, C. Y.
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

KUREYKO, I. A.
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

KUSHLAN, J. A.
Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

KUSTOV, YU. I.
Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

LABARRE, N.
Chloride and Lead in Urban Snow,
W74-09468 5B

LAMBDIN, C. E.
A Survey of Trace Metals in Human Hair,
W74-09573 5B

LAMKE, R. D.
Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

LANG, H.
Variations in the Relation Between Glacier Discharge and Meteorological Elements,
W74-09330 2C

LANGFORD, J. C.
55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

LAROE, E. T.
Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

LARSON, C. C.
The Effects of Land Use on Salmon Production,
W74-09411 4C

LARSON, G. P.
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

LARSON, R. D.
Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

LARSON, R. E.
Solids Balance on a Beef Cattle Oxidation Ditch,
W74-09707 5D

LAU, L. S.
Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

LAUWERYS, R. R.
Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

LEE, B. K.
Stochastic Analysis of Dune Bed Profiles,
W74-09619 2J

LEE, G. F.
Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

LEE, T. N.
The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

LEFEBVRE, C.
Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

LEHMANN, R. B.
Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

LEININGER, K. V.
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

LEMKE, A. E.
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

LENT, D. S.
Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

LENTON, R. L.
A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

LEOPOLD, L. B.
Water--A Primer,
W74-09613 2A

LEVI, D. R.
Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

LI, C. Y.
Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

LIEBERMAN, M. W.
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

LIGON, J. T.
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

LIND, A. O.
Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

LIND, B.
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

LINDAHL, P. C.
Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

LINNMAN, L.
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

LINSLEY, R.
Continuous Simulation Models in Urban Hydrology,
W74-09479 3D

LISTER, H.
Glacial Origin of Pro-Glacial Boulders,
W74-09336 2C

LITTMAN, F. E.
Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

LOCH, J. S.
Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

LOEHR, R. C.
Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

LOGSDON, G. S.
Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

LONGHOUSE, A. D.
Reduction in Moisture and Daily Removal of Wastes from Caged Laying Hens,
W74-09677 5D

LORILLAND, M. M.
Water and Land Slides,
W74-09485 4A

LOSEV, K. S.
Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

LUDINGTON, D. C.
Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

LUDWICK, J. C.
Tidal Currents, Sediment Transport, and Sand Banks in Chesapeake Bay Entrance, Virginia,
W74-09368 2L

MACK, E. J.
An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

MACMILLAN, K.
A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

MAHONEY, G. W. A.
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

MAHONEY, J. G.
Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

MAKI, H.
Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

MALES, R. M.
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

MALUEG, K. W.
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

MANGES, H. L.
Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

MANTON, W. I.
Significance of Lead Isotope Composition in Blood,
W74-09772 5A

MARCOUX, J. M.
Seabed Mineral Resource Production and the Free Market,
W74-09287 6E

MARINO, M. A.
Water-Table Fluctuation in Response to Recharge,
W74-09409 2F

MARRIOTT, L. F.
Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

MARTIN, D. W.
Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

MARTIN, J. H. JR.
Windrow Composting of Swine Wastes,
W74-09676 5D

MATHEWS, W. H.
Record of Two Jokullhlaups,
W74-09331 2C

MATTSON, V. R.
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

MAUL, G. A.
An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

MCANDREW, D. W.
Snow Load Analysis and Recreational Uses of Snow Data,
W74-09610 2C

MCBEAN, E. A.
A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

MCCALLA, T. M.
Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

MCCLURE, G. W.
A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

MCCULLOUGH, C. A.
Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

MCDANIEL, H. C.
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

MCELROY, A. D.
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

MCGUIRE, J. B.
The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

MCKENZIE, S. W.
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

MCKIBBEN, J. W.
Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

MCLERRAN, C. J.
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

MCQUIVEY, R. S.
Multiple Linearization Flow Routing Model,
W74-09627 8B

MEDBERY, H. C.
Managing Water Resources: Basic Considerations and Problems,
W74-09734 6B

MEENAGHAN, G. F.
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

MEIN, R. G.
Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

MELAND, N.
The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

MELBY, E. G.
Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

MELLOR, J. W.
Accelerated Growth in Agricultural Production and the Intersectoral Transfer of Resources,
W74-09550 3F

METCALF, C. C.
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

MICHAELS, A.
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

MICKLIN, P.P.
Environmental Hazards of Nuclear Wastes,
W74-09502 5B

MIELE, R. P.
Dewatering Digested Primary Sludge,
W74-09441 5D

MIKHAIL, A. D.
Capital Budgeting for Pollution Control,
W74-09558 5G

MILLER, J. F.
Weather Situations Associated with Floods During 1972,
W74-09392 2E

MILLER, M.
Guidelines for Successful Center-Pivot Irrigation,
W74-09798 3F

MILLIGAN, T.
More Production...Fewer Irrigations,
W74-09799 3F

MILLS, E. L.
Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

MILNE, J. B.
Chloride and Lead in Urban Snow,
W74-09468 5B

MILOY, J.
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

MINEAR, R. A.
Septic Tanks and Groundwater Pollution,
W74-09593 5B

MINER, J. R.
Agricultural Waste Management,
W74-09504 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

MIXON, F. O.
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

MOHANTY, S. K.
Discharge Relations for Submerged Weirs,
W74-09481 8A

MONIN, A. S.
Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

MONTGOMERY, D. G.
University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

MONTI, R. P.
Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

MOORE, W. JR.
Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

MORGAN, K. R.
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

MORRISON, R. D.
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

MOSS, M. E.
The Worth of Data in Hydrologic Design,
W74-09399 7C

MOTTS, W. S.
Some Potential Environmental Problems from Population Explosion and Urban Development in Massachusetts and Adjacent Parts of New England,
W74-09598 5B

MULLA, M. S.
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

MULLER, F.
Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

MULLIGAN, T. J.
Treatment and Disposal of Swine Waste,
W74-09704 5D

MUNTZ, W.
Rain Reservoirs and Rain Overflows (Regenbecken und Regenentlastungen),
W74-09509 4A

MURALIKRISHNA, U.
A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

MURPHY, L. S.
Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

NAKAMURA, K.
The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

NAY, M. W. JR.
Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

NAZARIAN, H. N.
Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

NELSON, J. C.
The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

NESHEIM, M. C.
Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

NEWTON, D. G. JR.
Low-Pressure Ultrafiltration Systems for Wastewater Contaminant Removal,
W74-09634 5D

NICHOLS, M. M.
Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

NICKERSON, G. L.
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

NICKLESS, G.
Heavy Metal Estimation in Biological Systems,
W74-09580 5B

NIKLEVA, S. N.
Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

NILSEN, H.
Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

NILSSON, K. O.
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

NISHIMURA, H.
Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

NITESCU, S.
Selection of the Iron and Manganese Removal Procedures To Be Used in Small Water Treatment Plants, (Alegerea schemelor de deferizare si demanganizare a apei la statiile de tratare mici),
W74-09487 5D

NORD, P. J.
Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

NORIYUKI, I.
Surface Sediments in Hamana Lake, the Pacific Coast of Central Japan,
W74-09751 2H

NORLAND, R. L.
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

NORRIS, E. R.
Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

NORSETH, T.
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

NORTON, L. B.
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 3,
W74-09321 5G

NYE, J. F.
Hydrology of the Intergranular Veins in a Temperate Glacier,
W74-09337 2C

Water at the Bed of a Glacier,
W74-09340 2C

O'CONNOR, J. T.
Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

O'DONNELL, C. L.
Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

ODLER, I.
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

OERTEL, G. F.
Hydrographic Framework of the Doboy Sound Estuary and Surveys of the Other Tidal Inlets Along the Coast of Georgia,
W74-09582 2L

OGLESBY, R. T.
Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

OHSAWA, M.
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

OLDENZIEL, D. M.
Influence of Suction and Blowing on Entrainment of Sand Particles,
W74-09616 2J

OLIVER, B. G.
Chloride and Lead in Urban Snow,
W74-09468 5B

OLSEN, D. A.
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

OLSON, T. C.
Water Loss Estimates from a Fallow Soil,
W74-09546 2D

OVERCASH, M. R.
Economics of Alternative Wastewater Treatment Systems,
W74-09427 5D

PAGE, R. W.
Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

PAINE, M. D.
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

PALIN, A. T.
Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

PANDEY, K. C.
Studies on Trematode Parasites of Luckow (India): I,
W74-09530 2I

PARFYUNAW, V. I.
Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

PARKER, G. G. JR.
Public Water Supplies in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09640 7C

Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

PARKER, R. S.
An Experimental Study of Drainage Basin Evolution and the Influence of Landforms on Hydrologic Variables,
W74-09586 4A

PARKHURST, J. D.
Dewatering Digested Primary Sludge,
W74-09441 5D

PASTUKHOVA, E. V.
Formation of the Benthos of the Ruz Reservoir in the First Years of its Existence (1966-1967), (In Russian),
W74-09507 2H

PATEL, S. I.
Growth of Subirrigated Japanese Holly as Affected by Soil Type and Depth,
W74-09600 2I

PATERSON, W. S. B.
Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

PATNI, N. K.
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

PATTERSON, J. E.
A General Purpose Event Water-Level Recorder,
W74-09604 7B

PATTERSON, J. W.
Septic Tanks and Groundwater Pollution,
W74-09593 5B

PAVLETIC, Z.
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

PAVONI, J. L.
Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

PEANTEK, G.
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

PEDROSA, H. X. A.
Sanitation and Public Health Planning,
W74-09317 5G

PERSON, H. L.
Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

PETERING, H. G.
Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

PETERSON, C. L.
Mercury in Tunas: A Review,
W74-09574 5B

PETERSON, S. A.
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

PEW, K. A.
Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

PHILLIPS, J. A.
Management of Lands Used for Waste Disposal,
W74-09424 5D

PHILLIPS, R. L.
Lagoons for Milking Center Wastes,
W74-09708 5D

PHILLIPS, W. M.
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

PIKUL, M. F.
Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

PILIE, R. J.
An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

PINNEKER, YE. V.
Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

PIPER, D. Z.
Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

PISARSKIY, B. I.
Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

PLASS, W. T.
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

POETNER, H. G.
Better Storm Drainage Facilities--At Lower Cost,
W74-09513 5D

POHLAND, F. G.
Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

POMONIK, G. M.
Vacuum Desorption Concept for Removing Oil from Water,
W74-09323 5G

PORTER, W. L.
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

POULOVASSILIS, A.
The Uniqueness of the Moisture Characteristics,
W74-09625 2G

POWELL, G. M.
Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

POWERS, W. L.
Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

PRATT, L.
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

PRICE, G. A.
Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

PRICE, K. R.
Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

PRICE, R. K.
Comparison of Four Numerical Methods for Flood Routing,
W74-09621 2E

PRUITT, W. O.
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

PUGH, K. B.
An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

A Hybrid Automatic Analyser,
W74-09622 5A

QAZI, R.
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

QURESHI, M.
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

RAHMAN, K. M. A.
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

RAISCH, J. W.
Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

RANDALL, C. W.
Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

RANDOLPH, P. D.
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

RAPP, G. R.
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

RASMUSSEN, L. A.
The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

RAUNER, YU. L.
Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

RAUSCHUBER, D. G.
The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

RAY, U. S.
Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

RECHARD, P. A.
Snow Sampling Techniques on a Small Subalpine Watershed,
W74-09608 2C

REED, R. R.
Liner Inserting Machine for Pipelines,
W74-09722 8C

REICH, B. M.
Design Criteria and Research Needs,
W74-09400 4A

REID, I. A.
Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

REIFF, I.
University Research and Practice: An Institutional Confrontation,
W74-09421 6E

REINERT, B. D.
Disposal of Aircraft Washrack Waste Water,
W74-09376 5D

REISENAUER, A. E.
Calculation of Soil Hydraulic Conductivity from Soil-Water Retention Relationships,
W74-09599 2G

REMSON, I.
Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

RENDON-HERRERO, O.
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

REYNOLDS, H. D.
An Information System for the Management of Lake Ontario,
W74-09752 2H

RICE, R. C.
Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

RICKLIS, J.
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

RIEMANN, U.
Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

ROBBINS, J. W. D.
Groundwater Pollution by Agriculture,
W74-09595 5B

ROBINSON, J. B.
Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

ROBSON, C. M.
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

RODRIGUE, R. F.
Dewatering Digested Primary Sludge,
W74-09441 5D

RODWIN, L.
Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

ROONEY, T. C.
Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

ROSE-ACKERMAN, S.
Effluent Charges: A Critique,
W74-09560 5G

ROSS, R. G.
Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

ROWEN, E. L.
Flood Damage in South Dakota,
W74-09394 2E

ROWLEY, M. E.
Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

RUMER, R. R. JR.
Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

RUSSELL, S. O.
Use of Decision Theory in Reservoir Operation,
W74-09478 4A

SAMESHIMA, K.
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

SANDAHL, J. E.
Floods in Minnesota,
W74-09395 2E

SATTERWHITE, M. B.
Grass Response to Applications of Beef-Cattle Feedlot Runoff,
W74-09700 5D

SCHAAKE, J. C. JR.
A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

SCHAEFER, D. G.
Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

SCHLEICHER, A. R.
The Environmental Impact Concept, and Its Effect on the National Gas Industry,
W74-09489 5C

SCHMIDT, H.
Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

SCHOONBEE, H. J.
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

SCHROEDER, H. A.
Relation of Trace Metals to Human Health,
W74-09790 5C

SCHUMM, S. A.
An Experimental Study of Drainage Basin Evolution and the Influence of Landforms on Hydrologic Variables,
W74-09586 4A

SCHUSTER, L. R.
Treatment of Swine Wastes,
W74-09684 5D

SCOTT, M. S.
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

SCOTT, T. W.
A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

SEABROOK, B. L.
Land Application of Wastewater,
W74-09423 5D

SHARP, G. D.
Mercury in Tunas: A Review,
W74-09574 5B

SHAW, M. G.
Reuse and Recycle of Water in Industry,
W74-09444 5D

SHELL, G. L.
Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

SHEN, Y. S.
Study of Arsenic Removal from Drinking Water,
W74-09776 5F

SHEPPARD, C. C.
The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

SHIDLER, A. E.
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

SHIH, C. S.
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

SHORT, W. L.
Low-Pressure Ultrafiltration Systems for Wastewater Contaminant Removal,
W74-09634 5D

SHUKLA, N. K.
Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

SHULENBERGER, M.
Right of Private Party to Maintain Action to Enforce Provisions of Rivers and Harbors Act of 1899,
W74-09305 6E

SHVARTSEVA, N. M.
Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

SICILIANO, J.
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

SIERKA, R. A.
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

SILBERMANN, P. T.
Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

SIMONEIT, B. R.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

SIMONIS, U. E.
Environmental Disruption: Implications for Economic Planning,
W74-09564 6B

SKAGGS, R. W.
Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

SKALNY, J.
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

SKRINDE, R. T.
Low-Pressure Ultrafiltration Systems for Wastewater Contaminant Removal,
W74-09634 5D

SLADE, E. A.
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

SLITER, J. T.
Ozone: An Alternative to Chlorine,
W74-09714 5D

SMALL, H.
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

SMARDON, R. C.
Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

SMEDLEY, S. C.
The Effects of Land Use on Salmon Production,
W74-09411 4C

SMITH, A. W.
Ecological River Basin Management,
W74-09559 4A

SMITH, C. E.
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

SMITH, C. V.
Ultrafiltration Water Treatment,
W74-09636 5F

SMITH, D. H.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

SMITH, R. J.
Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

SMITH, T. I. J.
The Commercial Feasibility of Rearing Pompano, Trachinotus carolinus (Linnaeus), in Cages,
W74-09566 8I

SMITH, W. H.
Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

SMITH, W. L.
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

SMOLYAK, L. P.
Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

SNEED, R. E.
Irrigation Cost for Land Disposal,
W74-09428 5D

SOBEL, A. T.
Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

Undercage Drying of Laying Hen Manure,
W74-09678 5D

SOKOL, R. A.
Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

SOLOMON, M. J.
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

SORENSON, J. R. J.
Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

SRIDHARAN, N.
Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

ST, J.
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

STALNAKER, R. M.
Apparatus for Releasing Chemicals Clearing and Cleaning Waste Pipes,
W74-09725 5D

STALTER, R.
The Vegetation of the Cooper River Estuary,
W74-09383 2L

STANSBY, M. E.
Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

STARA, J. F.
Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

STENBORG, T.
Some Viewpoints on the Internal Drainage of Glaciers,
W74-09333 2C

STERN, D. H.
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

STERN, M. S.
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

STEWART, J. I.
Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

STICKNEY, R. R.
Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

STILINOVIC, B.
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

STILLINGS, B. R.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

STONE, D.
Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

STONE, L. R.
Water Loss Estimates from a Fallow Soil,
W74-09546 2D

STRICKLAND, C. L.
Underwater Television - Its Development and Future,
W74-09545 7B

SULLIVAN, C. Y.
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

SUSLOV, V. F.
Hydrological Regime of Glaciers in the Alay Range, Central Asia,
W74-09346 2C

SUSSKIND, L.
Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

SUTHERLAND, J. L.
Project CUM II--Studies of the Rain Parameters of Randomly Seeded Warm and Cold Cumuli,
W74-09370 3B

SWETS, D. H.
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

SWINYARD, C. A.
Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

SYMONS, J. M.
Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

SZAKATSITS, G.
Flood Runoff Systems with Collector Channel and Fast Discharge for Dams (Volgyzarogatak gyujtocsatornas, surrantos arapasztoi),
[redacted]74-09720 8A

TABB, D. C.
The Coastal Interceptor Waterway,
W74-09614 5G

TABLER, R. D.
Evaporation Losses of Windblown Snow, and the Potential for Recovery,
W74-09611 2D

TACKETT, R.
State-of-the-Art of Waste Disposal in the Coatings Industry (As of June 1973),
W74-09506 5E

TAG, P. M.
Results Generated from a One-Dimensional Warm Fog Model Which Simulates Hygroscopic Seeding,
W74-09322 3B

TAIGANIDES, E. P.
Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

TAMPLIN, B. R.
Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

TANKA, S.
Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

TANNENBAUM, S. R.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

TATU, G.
Checking the Size of Sewerage Infiltration and Leaks Occurring Under Operating Conditions, (Verificarea marimii infiltratiilor si exfiltratillor din canalizari in timpul exploatarii),
W74-09493 5D

TAYLOR, R. G.
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

TEDLA, S.
On the Characterization of the Parasite Fauna of Yellow Perch (Perca fluviatilis L.) in Five Lakes, in Southern Ontario, Canada,
W74-09541 5B

TERRY, R. C.
Road Salt, Drinking Water and Safety,
W74-09537 4C

THOMAS, D. M.
Floods of 1972,
W74-09391 2E

THOMAS, J.
Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

THOMAS, W. A.
Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

THOMPSON, G.
Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

THRAILKILL, J.
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

TIEDJE, J. M.
Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

TIETENBERG, T. H.
Controlling Pollution by Price and Standard Systems: A General Equilibrium analysis,
W74-09561 5G

TINGA, J. H.
Growth of Subirrigated Japanese Holly as Affected by Soil Type and Depth,
W74-09600 2I

TISCHLER, L. F.
The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

TOLSTIKHIN, O. N.
Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

TRAINER, F. W.
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

TRENT, R. E.
Optimal Design for Highway Drainage Culverts,
W74-09630 4A

TRESHNIKOV, A. F.
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

TRIVEDI, B. K.
Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

TROFIMUK, P. I.
Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

TROTZKY, H. M.
The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

TRUST, T. J.
An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09[illegible] 2I

TSAI, M. C.
Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

TSIGEL'NAYA, I. D.
Role of Ice Run-Off in the Water Balance of the Mountain Area of Central Asia,
W74-09345 2C

TURKEVICH, A. L.
Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

TURNER, W. R.
Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

TWISS, R. H.
Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

URANO, K.
The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

URL, M.
Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

UTEKHIN, V. D.
Efficiency of Functioning of the Main Ecosystems of the European Forest-Steppe, (In Russian),
W74-09500 2I

VAN EVERDINGEN, R. O.
Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

VAN FLEET, G. L.
Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

VARSHNEY, K. G.
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

VARSHNEY, R. S.
Discharge Relations for Submerged Weirs,
W74-09481 8A

VASIL' CHENKO, O. N.
Feeding and Growth of Young Bream at Spawning and Rearing Farms of the Volga Delta Under Stream-Flow Control Conditions, (In Russian),
W74-09313 8I

VERMEULEN, J.
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

VICENS, G. J.
A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

VIEHL, K.
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

VLASIN, R. D.
Ecological Concepts and Applications to Planning,
W74-09418 6B

VOELKEL, K. G.
Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

VOYT, F. YA.
Procedure for Evaluating the Effect of Convective Cloud Modification for the Purpose of Artificially Controlling Precipitation and the Results of Aircraft Studies on the Structure of Cumulus Clouds,
W74-09378 3B

VUSKOVIC, B.
Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

WALDBOTT, G. L.
Health Effects of Environmental Pollutants,
W74-09547 5C

WALL, D. J.
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

WALLINGFORD, G. W.
Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

WALTON, J. R.
Granules Containing Lead in Isolated Mitochondria,
W74-09787 5C

WALTON, W. C.
Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

WANG, D. I. C.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

WATKINS, F. A. JR.
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

WATTS, J. B.
Priming Unit for Distributing Priming Water to Multiple Sewer Line Water Traps,
W74-09732 5D

WEBER, W. J. JR.
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

WEBSTER, L.
How Triple Siphon Solved Sewage Transfer Across Welland River,
W74-09517 5D

WEEKS, M. E.
Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

WEERTMAN, J.
Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

WEHRY, A.
Experimental Field Studies Required for the Design of Drainages, (Studii experimentale in teren, necesare proiectarii drenajelor),
W74-09495 4A

WEIR, J. E. JR.
Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

WEISS, A. B.
Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

WEISS, B.
Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

WELLS, D. M.
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

WEST, L. E.
Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

WESTLAKE, W. E.
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

WHITE, R. K.
Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

WIEGAND, C. J. W.
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

WILLEY, C. R.
Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

WILLSON, G. B.
Aeration Rates for Rapid Composting of Dairy Manure,
W74-09675 5D

WILSON, T. V.
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

WIRICK, M. G.
Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

WITSCHI, H.
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

WOOD, A. J.
An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09723 2I

WOOD, R. W.
Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

WOODS, W. R.
Chemical Studies of Solids, Runoff, Soil Profile and Groundwater from Beef Cattle Feedlots at Mead, Nebraska,
W74-09680 5B

WORTHINGTON, P. F.
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

WREN, E. J.
Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

WRIGHT, C. G.
American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

YANG, P-Y.
Control of Biological Solids Concentration in Extended Aeration,
W74-09508 5D

YEVJEVICH, V.
Simulation Accuracies of Gradually Varied Flow,
W74-09628 8B

YOKLEY, P. JR.
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

YOST, E. F.
An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

YOUNG, C. W.
Depth Prediction for Earth-Penetrating Projectiles,
W74-09534 8D

YOUNG, G. K.
Optimal Design for Highway Drainage Culverts,
W74-09630 4A

YUDENFREUND, M.
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

YURKYEVICH, I. D.
Dynamics of Forest, Meadow and Swamp Vegetation in Connection with Reclamation (Based on Studies in Belorussia), (In Byelorussian),
W74-09746 2I

ZACHOS, G. H.
Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

ZELDIN, M.
Audubon Black Paper Number 1, Oil Pollution,
W74-09315 5C

ZIPP, R.
Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

ZONN, I. S.
Water Problems in the Arid Western Regions of the USA, (In Russian),
W74-09469 4A

ZWERMAN, P. J.
Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

ORGANIZATIONAL INDEX

AEROJET NUCLEAR CO., IDAHO FALLS, IDAHO.
Telemetered Profiling Isotopic Snow Gauge: Final Report and Specifications,
W74-09757 2C

AGRICULTURAL RESEARCH COUNCIL, CAMBRIDGE (ENGLAND). UNIT OF SOIL PHYSICS.
The Uniqueness of the Moisture Characteristics,
W74-09625 2G

AGRICULTURAL RESEARCH SERVICE, PHILADELPHIA, PA. EASTERN UTILITIES RESEARCH AND DEVELOPMENT DIV.
Reverse Osmosis: Application to Potato-Starch Factory Waste Effluents,
W74-09637 5D

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Soil Clogging During Infiltration of Secondary Effluent,
W74-09467 5D

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.
Humidity Effects on Yield and Water Relations of Nine Crops,
W74-09796 3C

AGRICULTURAL RESEARCH SERVICE, WASHINGTON, D.C.
Application of Sewage Sludge to Agricultural Land in Minnesota (Final Environmental Statement),
W74-09265 5D

AIR FORCE ACADEMY, COLO.
Biological Treatability of Trinitrotoluene Manufacturing Wastewater,
W74-09470 5D

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Stochastic Analysis of Orthokinetic Flocculation,
W74-09719 5D

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT BIOLOGII VNUTRENNYKH VOD.
Content and Composition of Plant Pigments in the Rybinsk Reservoir (In Russian),
W74-09446 2H

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT GEOGRAFII.
Role of Ice Run-Off in the Water Balance of the Mountain Area of Central Asia,
W74-09345 2C

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT OKEANOLOGII.
Temperature and Salinity Statistics of Surface Waters of the Atlantic Ocean (Statistika temperatury i solenosti poverkhnosti Atlantiki),
W74-09650 2K

AKADEMIYA NAUK SSSR, MOSCOW. VSESOYUZNYI INSTITUT NAUCHNOI I TEKNICHESKOI INFORMATSII.
Estimation of Run-Off from Antarctic and Greenland Ice Sheets,
W74-09348 2C

ALASKA STATE DEPT. OF FISH AND GAME, JUNEAU.
The Effects of Land Use on Salmon Production,
W74-09411 4C

ALIGARH MUSLIM UNIV. (INDIA). DEPT. OF CHEMISTRY.
Quantitative Separation of Magnesium and Palladium from Numerous Metal Ions on Titanium Tungstate Papers by Electrochromatography,
W74-09782 5A

ANDERSON-NICHOLS AND CO., BOSTON, MASS. ENVIRONMENTAL SCIENCES DIV.
Wastewater System Alternates: What Are They...and What Cost,
W74-09718 5D

ANDHRA UNIV., WALTAIR (INDIA). DEPT. OF CHEMISTRY.
A New Vanadyl (IV) Thiocyanate Method for the Spectrophotometric Determination of Vanadium (IV),
W74-09765 5A

ARGONNE NATIONAL LAB., ILL.
Environmental Status of the Lake Michigan Region: Volume 7. Earthquake History and Measurement with Application to the Lake Michigan Drainage Basin,
W74-09407 2H

ARGONNE NATIONAL LAB., ILL. CENTER FOR ENVIRONMENTAL STUDIES.
An Evaluation of the Impact of Land Use on Environmental Quality,
W74-09419 4A

ARIZONA UNIV., TUCSON. DEPT. OF NUCLEAR ENGINEERING.
Conceptual Design Evaluation of a Physical-Chemical Domestic Waste Treatment System Utilizing Power Plant Waste Heat,
W74-09253 5D

ARKTICHESKII I ANTARKTICHESKII NAUCHNO-ISSLEDOVATELsKII INSTITUT, LENINGRAD (USSR).
New Data on Water Circulation in the Arctic Basin (Novyye dannyye o tsirkulyatsii vod Arkticheskogo basseyna),
W74-09649 2E

ARMY ENGINEER DISTRICT, BALTIMORE, MD.
Raystown Lake--Raystown Branch Juniata River, Pennsylvania (Final Environmental Statement).
W74-09262 8D

ARMY ENGINEER DISTRICT, CHARLESTON, S.C.
Flood Plain Information; Pocotaligo River-Turkey Creek-Cane Savannah Creek-Green Swamp-Shot Pouch Creek-Rock Bluff Swamp, Sumter County, South Carolina.
W74-09355 4A

Flood Plain Information; Wilkesboro and North Wilkesboro, North Carolina; Yadkin River and Reddies River.
W74-09356 4A

Flood Plain Information; Reedy River, Richland Creek, Greenville County, South Carolina.
W74-09358 4A

ARMY ENGINEER DISTRICT, JACKSONVILLE, FLA.
Beach Erosion Control Study on Manatee County, Florida (Final Environmental Statement).
W74-09264 4A

ARMY ENGINEER DISTRICT, NEW YORK, N.Y.
Maintenance of the Newark Bay, Hackensack and Passaic Rivers Navigation Project, New Jersey (Final Environmental Statement).
W74-09267 4A

ARMY ENGINEER DISTRICT, NORFOLK, VA.
Buena Vista Flood Protection Project, Buena Vista, Virginia (Final Environmental Statement),.
W74-09272 4A

ARMY ENGINEER DISTRICT, PITTSBURGH, PA.
Flood Plain Information: Ohio River, Brooke County, West Virginia.
W74-09354 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.
New Melones Lake Stanislaus River, California: Supplemental Data on Use of Conservation Yield (Supplemental Environmental Impact Statement).
W74-09269 4A

ARMY ENGINEER DISTRICT, SEATTLE, WASH.
Libby Reregulating Dam and Lake--At Site Power Kootenai River, Montana (Final Environmental Statement).
W74-09266 8C

ARMY ENGINEER DISTRICT, TULSA, OKLA.
El Dorado Lake, Walnut River, Kansas, Volume 1, (Final Environmental Statement).
W74-09268 4A

Port Verdigris 33, Inc., Verdigris River, Oklahoma (Final Environmental Statement).
W74-09270 4A

ARMY ENGINEER DISTRICT, WILMINGTON, N.C.
Flood Plain Information; Kit and Northeast Creeks; Research Triangle Area, Durham and Wake Counties, North Carolina.
W74-09357 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Wave Action and Breakwater Location Harbor of Refuge for Light-Draft Vessels, Barcelona, New York,
W74-09259 8B

ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND, WASHINGTON, D.C. SANITARY ENGINEERING RESEARCH BRANCH.
Health Aspects of Land Application of Wastewater at Military Installations,
W74-09426 5D

ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT CENTER, FORT BELVOIR, VA.
Treatment of Wastewaters From Military Field Laundry, Showers, and Kitchen Units,
W74-09410 5D

ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LAB., MIAMI, FLA. PHYSICAL OCEANOGRAPHY LAB.
An Oceanographic Observation of New York Bight from ERTS-1,
W74-09589 5B

ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, (BRITISH COLUMBIA).
Mean Precipitation and Snowfall Maps for a Mountainous Area of Potential Urban Development,
W74-09612 2C

AXEL HEIBERG EXPEDITION, MONTREAL (QUEBEC).
Velocity Fluctuations and Water Regime of Arctic Valley Glaciers,
W74-09338 2C

BATTELLE COLUMBUS LAB., OHIO.
Urban Public Policy and Political Institutions for Water Quality Management on Lake Erie: Year Two,
W74-09653 5G

BATTELLE-PACIFIC NORTHWEST LAB., RICHLAND, WASH.
55Fe Concentration and Specific Activities in North Pacific Marine Organisms,
W74-09733 5C

BATTELLE-PACIFIC NORTHWEST LAB., RICHLAND, WASH. DEPT. OF WATER AND LAND RESOURCES.
Calculation of Soil Hydraulic Conductivity from Soil-Water Retention Relationships,
W74-09599 2G

BEAK (T.W.) CONSULTANTS LTD., TORONTO (ONTARIO).
Biological Monitoring of the Fraser River Near Prince George, B.C.,
W74-09463 5C

BEARD (ARTHUR) ENGINEERING, INC., CHEVY CHASE, MD.
Chemical Addition to Trickling Filter Plants,
W74-09710 5D

BECHTEL POWER CORP., LOS ANGELES, CALIF.
Water Well Design for Earthquake-Induced Motions,
W74-09535 8B

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF GEOLOGY AND GEOPHYSICS.
A Centrifugal Technique for Rapidly Estimating the Permeability of a Consolidated Sandstone,
W74-09527 8E

BOSTOCK HILL AND RIGBY, BIRMINGHAM (ENGLAND).
Reuse and Recycle of Water in Industry,
W74-09444 5D

Some Conservation Problems in the Metal-Finishing Industry,
W74-09577 5D

BOYCE THOMPSON INST. FOR PLANT RESEARCH, INC., YONKERS, N. Y.
A Membrane Biological Filter Device for Reducing Waterborne Biodegradable Pollutants,
W74-09713 5D

BRISTOL UNIV. (ENGLAND). H. W. WILLS PHYSICS LAB.
Hydrology of the Intergranular Veins in a Temperate Glacier,
W74-09337 2C

Water at the Bed of a Glacier,
W74-09340 2C

BRISTOL UNIV. (ENGLAND). SCHOOL OF CHEMISTRY.
Heavy Metal Estimation in Biological Systems,
W74-09580 5B

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
Use of Decision Theory in Reservoir Operation,
W74-09478 4A

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF GEOLOGY.
Record of Two Jokullhlaups,
W74-09331 2C

BROOKHAVEN NATIONAL LAB., UPTON, N.Y. HEALTH PHYSICS AND SAFETY DIV.
Comparing Effluent Releases From Nuclear and Fossilfueled Power Plants,
W74-09503 5B

BROWN (FLOYD G.) AND ASSOCIATES, LTD., MARION, OHIO.
General Plan for Recommended Storm Drainage Facilities, Marion County, Ohio.
W74-09359 5D

BRUSSELS UNIV. (BELGIUM).
Outbreeding and Inbreeding in a Zinc-Lead Mine Population of Armeria maritima,
W74-09788 5C

BUREAU OF MINES, BARTLESVILLE, OKLA. BARTLESVILLE ENERGY RESEARCH CENTER.
Subsurface Disposal of Pickle Liquor,
W74-09583 5E

BUREAU OF RECLAMATION, MID-PACIFIC REGIONAL OFFICE, SACRAMENTO, CALIF.
Proposed Irrigation Distribution System for Pond-Poso Improvement District (PL 984), Kern County, California (Final Environmental Impact Statement).
W74-09263 4A

BUREAU OF SPORT FISHERIES AND WILDLIFE, WASHINGTON, D.C. DIV. OF WILDLIFE REFUGES.
Cadmium, Nickel, Lead, and Zinc in Earthworms from Roadside Soil,
W74-09780 5C

CALIFORNIA STATE DEPT. OF PUBLIC HEALTH, BERKELEY. SANITATION AND RADIATION LAB.
Mercury in Water: An Evaluation of Laboratories and Methodology,
W74-09774 5A

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Ground Water Quality and Solid Waste Management-- A Selective Bibliography,
W74-09319 5E

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO. DIV. OF RESOURCES DEVELOPMENT.
Managing Water Resources from the Wrong Place at the Wrong Time,
W74-09528 6B

CALIFORNIA STATE UNIV., SAN DIEGO. DEPT. OF GEOLOGY.
Problems Related to the Evaluation of Groundwater Resources of the Crystalline Rock Area, San Diego County, California,
W74-09544 2F

CALIFORNIA UNIV., BERKELEY.
Water--A Primer,
W74-09613 2A

CALIFORNIA UNIV., BERKELEY. DEPT. OF LANDSCAPE ARCHITECTURE.
Planning for Areas of Significant Environmental and Amenity Value,
W74-09420 6B

CALIFORNIA UNIV., BERKELEY. SPACE SCIENCES LAB.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. II. Organic Matter in San Francisco Bay Area Water,
W74-09742 5A

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
Water-Table Fluctuation in Response to Recharge,
W74-09409 2F

Functions to Predict Optimal Irrigation Programs,
W74-09476 3F

CALIFORNIA UNIV., DAVIS. WATER RESOURCES CENTER.
Water Resources Center Annual Report, July 1, 1972-June 30, 1973.
W74-09659 9A

CALIFORNIA UNIV., LOS ANGELES.
The Future of the Urban Habitat,
W74-09413 6E

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ARCHITECTURE AND URBAN PLANNING.
University Research and Practice: An Institutional Confrontation,
W74-09421 6E

CALIFORNIA UNIV., RIVERSIDE.
Economic Policies, Environmental Problems, and Land Use,
W74-09417 6B

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF ENTOMOLOGY.
Aquatic Midge Larvicides, Their Efficacy and Residues in Water, Soil, and Fish in a Warm-Water Lake,
W74-09443 5G

CALSPAN CORP., BUFFALO, N.Y.
An Investigation of the Microphysical and Micrometeorological Properties of Sea Fog, First Summary Report, Project Sea Fog,
W74-09406 2B

CARNEGIE INSTITUTION OF WASHINGTON, WASHINGTON, D.C.
Land-Use Institutions in the Washington-Baltimore Region-A Mirror for Metropolitan America,
W74-09414 6E

CASE WESTERN RESERVE UNIT., CLEVELAND, OHIO. URBAN AND ENVIRONMENTAL STUDIES.
University Students Implement Public Policy Rural Community Action with a Water Development Project,
W74-09557 5G

CAST IRON PIPE RESEARCH ASSOCIATION, OAK BROOK, ILL.
Engineering and Construction Practices for Gray and Ductile Cast-Iron Pipe,
W74-09728 8B

CH2M/HILL, INC., CORVALLIS, OREG.
Available Air Measurements Applied to Flotation Thickener Evaluations,
W74-09451 5D

CH2M-HILL, REDDING, CALIF.
Optimizing Surface Irrigation Uniformity by Nonuniform Slopes,
W74-09800 3F

CHICAGO UNIV., ILL. ENRICO FERMI INST.
Heavy Elements in Surface Materials: Determination by Alpha Particle Scattering,
W74-09770 5A

CINCINNATI UNIV., OHIO. COLL. OF MEDICINE.
Mercury in Human Hair, A Study of the Residents of Los Alamos, NM, and Pasadena, Calif., by Cold Vapor Atomic Absorption Specrophotometry,
W74-09759 5A

Interferences in the Determination of Metallic Elements in Human Hair, An Evaluation of Zinc, Copper, Lead and Cadmium Using Atomic Absorption Spectrophotometry,
W74-09760 5A

CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N.Y.
Hardened Portland Cement Pastes of Low Porosity, Part 5: Compressive Strength,
W74-09522 8F

CLEMSON UNIV. CLEMSON, S.C. DEPT. OF AGRICULTURAL ENGINEERING.
Distribution of Moisture in the Unsaturated Soil Profile on a Piedmont Watershed,
W74-09518 2G

CLEMSON UNIV., S.C. DEPT. OF ENTOMOLOGY AND ECONOMIC ZOOLOGY.
Biology, Distribution, Importance and Control of Deer Flies and Horse Flies (Diptera:Tabanide) in Water-Oriented Recreational Areas,
W74-09363 5G

CLEVELAND DEPT. OF PUBLIC UTILITIES, OHIO.
Data Acquisition and Combined Sewer Controls in Cleveland,
W74-09716 5D

COAST GUARD, WASHINGTON, D.C. NAVAL ENGINEERING DIV.
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 3,
W74-09321 5G

COAST GUARD, YORKTOWN, VA.
U.S. Coast Guard Oil Pollution Investigation and Control School.
W74-09753 5G

COLLIER COUNTY CONSERVANCY, INC., NAPLES, FLA.
Environmental Considerations for Water Management District 6 of Collier County,
W74-09360 6B

COLORADO DEPT. OF NATURAL RESOURCES, DENVER. DIV. OF WATER RESOURCES, PLANNING AND INVESTIGATIONS.
Analytical Model for Management of Alluvial Aquifers,
W74-09477 4B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Optimal Control of Flow in Combined Sewer Systems,
W74-09652 5D

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF EARTH RESOURCES.
An Experimental Study of Drainage Basin Evolution and the Influence of Landforms on Hydrologic Variables,
W74-09586 4A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF MICROBIOLOGY.
Cloud Seeding for Snow Augmentation: Land Use Ramifications of Residual Silver Iodide Nucleating Agents,
W74-09606 5B

COLORADO UNIV., NEDERLAND. INST. OF ARCTIC AND ALPINE RESEARCH.
Avalanche Studies in the San Juan Mountains of Southwestern Colorado,
W74-09607 2C

CONSET, INC., WASHINGTON, D.C. NATIONAL DEMONSTRATION WATER PROJECT.
Beyond 'City Water': Rural Water System Design,
W74-09538 6B

Two Tests for the Cluster Well Concept,
W74-09549 8A

CORNELL UNIV., ITHACA, N.Y.
Control of Biological Solids Concentration in Extended Aeration,
W74-09508 5D

Windrow Composting of Swine Wastes,
W74-09676 5D

Undercage Drying of Laying Hen Manure,
W74-09678 5D

Evaluation of Dehydrated Poultry Manure as a Potential Poultry Feed Ingredient,
W74-09688 5D

Removal of Phosphorus from Liquid Animal Manure Wastes,
W74-09696 5D

A Study of Corn Response and Soil Nitrogen Transformations Upon Application of Different Rates and Sources of Chicken Manure,
W74-09701 5D

Pilot Plant Comparison of Liquid and Dry Waste Management Systems for Poultry Manure,
W74-09709 5D

An Information System for the Management of Lake Ontario,
W74-09752 2H

CORNELL UNIV., ITHACA, N.Y. DEPT. OF AGRICULTURAL ECONOMICS.
Accelerated Growth in Agricultural Production and the Intersectoral Transfer of Resources,
W74-09550 3F

CORNELL UNIV., ITHACA, N.Y. DEPT. OF AGRONOMY.
Surface Runoff Nutrient Losses from Various Land Disposal Systems for Dairy Manure,
W74-09702 5B

Lead, Cd, Zn, Cu, and Co in Streams and Lake Waters of Cayuga Lake Basin, New York.
W74-09762 5B

CORPS OF ENGINEERS, WALTHAM, MASS.
Maintenance Dredging and Jetty Repair, Hampton Harbor, New Hampshire (Final Environmental Statement).
W74-09273 4A

Maintenance Dredging, Chatham (Stag E) Harbor, Massachusetts (Final Environmental Statement).
W74-09274 4A

CORPS OF ENGINEERS, WASHINGTON, D.C.
Environmental Statements--Engineer Regulations on Preparation and Coordination.
W74-09258 6E

DARTMOUTH COLL., HANOVER, N.H. DEPT. OF PHYSIOLOGY.
Relation of Trace Metals to Human Health,
W74-09790 5C

DELAWARE UNIV., NEWARK. DEPT. OF BIOLOGICAL SCIENCES.
Pathogenic Organisms in the Murderkill River Estuary,
W74-09466 5B

DENVER BOARD OF WATER COMMISSIONERS, COLO.
Computer Modeling Applications in Urban Water Planning,
W74-09654 6A

DENVER WATER DEPT., COLO.
'Pig' Brings Back Capacity,
W74-09516 8C

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATER BRANCH.
Subglacial Leakage of Summit Lake, British Columbia, by Dye Determinations,
W74-09332 2C

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATERS BRANCH.
Glacier Discharge Simulation by Ground-Water Analogue,
W74-09327 2C

Subsurface Disposal of Waste in Canada, Injection of Liquid Wastes in Deep Wells, A Preliminary Appraisal,
W74-09536 5B

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER QUALITY DIV.
Chloride and Lead in Urban Snow,
W74-09468 5B

DEPARTMENT OF THE ENVIRONMENT, WINNIPEG (MANITOBA). FISHERIES AND MARINE SERVICE.
A Benthos Survey (1972) in the North Saskatchewan River in the Vicinity of the Prince Albert Pulp Company, Prince Albert, Saskatchewan,
W74-09459 5C

Benthos Studies (1971 and 1972) on the Winnipeg River in the Vicinity of the Abitibi

DEPARTMENT OF THE ENVIRONMENT, WINNIPEG (MANITOBA). FISHERIES AND

Manitoba Paper Company, Pine Falls, Manitoba,
W74-09460 5C

DESERT INST., ASHKHABAD (USSR).
Rain Flood Discharge in Northeastern Slopes of Kopet-Dag (USSR), (In Russian),
W74-09365 4A

DORR-OLIVER INC., STAMFORD, CONN.
Ultrafiltration Water Treatment,
W74-09636 5F

DURHAM UNIV. N.C.
Fatigue Behavior of Rock,
W74-09523 8E

EASTERN NEW MEXICO UNIV., PORTALES. DEPT. OF BIOLOGICAL SCIENCES.
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
W74-09596 5B

EASTMAN CHEMICAL PRODUCTS, INC., KINGSPORT, TENN. POLYMER TECHNOLOGY DIV.; AND EASTMAN CHEMICAL PRODUCTS, INC., KINGSPORT, TENN. PHOTOGRAPHIC TECHNOLOGY DIV.
Industrial Waste Treatment Opportunities for Reverse Osmosis,
W74-09635 5D

ECODNYE CORP., CHICAGO, ILL. (ASSIGNEE).
Method for Treating Water Containing Suspended Solids from a Sanitary System,
W74-09724 5D

ECONOMIC RESEARCH SERVICE, WASHINGTON, D.C. FARM PRODUCTION ECONOMICS DIV.
Implications of State Environmental Legislation on Livestock Waste Management,
W74-09670 5G

EIDGENOESSFISCHE TECHNISHE HOCHSCHULE, ZURICH (SWITZERLAND). VERSUCHSANSTALT FUER WASSERBAU UND ERDBAU.
Influence of Changes in the Glacierized Area on Summer Run-Off in the Porte Du Scex Drainage Basin of the Rhone,
W74-09344 2C

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND). VERSUCHSANSTALT FUER WASSERBAU UND ERDBAU.
Variations in the Relation Between Glacier Discharge and Meteorological Elements,
W74-09330 2C

ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. SURVEILLANCE AND ANALYSIS DIV.
Water Quality Portion of the Cooper River Environmental Study.
W74-09385 5B

ENVIRONMENTAL PROTECTION AGENCY, DALLAS, TEX.
Salinity Control Interim Report for Water Supply and Water Quality Control Study, Brazos River Basin, Texas.
W74-09755 5G

ENVIRONMENTAL PROTECTION AGENCY, DENVER, COLO. REGION VIII.
Utah Environmental Problems and Legislative Response: Part 1,
W74-09282 5G

ENVIRONMENTAL PROTECTION AGENCY, SPRINGFIELD, ILL.
Flow Smoothing in Sanitary Sewers,
W74-09471 5D

Pesticide Analysis in Water,
W74-09484 5A

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Agriculture in the Environment,
W74-09664 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON D.C. DIV. OF MUNICIPAL WASTE WATER PROGRAMS.
Land Application of Wastewater,
W74-09423 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. EMERGENCY OPERATIONS AND PLANNING DIV.
Restoration of Wastewater Facilities Damaged by Tropical Storm Agnes,
W74-09496 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF RESEARCH AND MONITORING.
Implications of the Permit Program in the Poultry and Animal Feeding Industry,
W74-09667 5G

ENVIROTECH CORP., SALT LAKE CITY, UTAH. EIMCO PROCESS MACHINERY DIV.
Carbon Treatment of a Municipal Wastewater,
W74-09715 5D

ESCOLA NACIONAL DE SAUDE PUBLICA E DE MEDICINA TROPICAL, LISBON (PORTUGAL).
Sanitation and Public Health Planning,
W74-09317 5G

FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D.C. OFFICE OF ENGINEERING AND TRAFFIC OPERATIONS.
Observations on the Causes of Bridge Damage in Pennsylvania and New York Due to Hurricane Agnes,
W74-09396 2E

FEDERAL RESERVE BANK OF KANSAS CITY, MO.
Economic Impact of Agricultural Pollution Control Programs,
W74-09665 5G

FINNISH NATIONAL WATER BOARD, HELSINKI.
Waste Water Loads and Their Possible Reductions in the Finnish Forest Industry (Suomen metsaeteollisuuden jaetievesikuormitus ja sen kehitysnaekmat),
W74-09465 5B

GATES (W. E.) AND ASSOCIATES, INC., FAIRFAX, VA.
Communications for Urban Water Resources Management--A Review and Annotated Bibliography,
W74-09251 6B

Design of Prototype Mass Media Programs for Testing in the Lower James River Basin,
W74-09252 6B

GENERAL ELECTRIC CO., SCHENECTADY, N.Y. (ASSIGNEE).
Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-09729 5D

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX.
Use of Base-Runoff Recession Curves to Determine Areal Transmissivities in the Upper Potomac River Basin,
W74-09740 2E

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
Flood Survey at Proposed Taps Crossing of Yukon River near Stevens Village, Alaska,
W74-09405 4C

GEOLOGICAL SURVEY, BAY ST. LOUIS, MISS.
Desktop Computer Flow Routing,
W74-09626 8B

Multiple Linearization Flow Routing Model,
W74-09627 8B

GEOLOGICAL SURVEY, COLUMBIA, S.C.
Water Supply Evaluation and Proposed Comprehensive Study of the Charleston-Bushy Park Industrial Complex, South Carolina,
W74-09389 2L

GEOLOGICAL SURVEY, CORPUS CHRISTI, TEX.
Migration and Redistribution of Zinc and Cadmium in Marine Estuarine System,
W74-09777 5B

GEOLOGICAL SURVEY, EDGEWATER, MD.
Changes in Oxygen and Primary Production of the Patuxent Estuary, Maryland, 1963 Through 1969,
W74-09624 5B

GEOLOGICAL SURVEY, HARRISBURG, PA.
Progress Report on the Effect of Ground-Water Conditions on Local Flooding in the Kingston Area, Pa.,
W74-09366 4B

GEOLOGICAL SURVEY, LAKEWOOD, COLO.
Hydraulic Testing and Sampling of Holes RB-E-01 and RB-D-01, Project Rio Blanco, Rio Blanco County, Colorado,
W74-09601 4B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Ground-Water Data, 1972, Indian Wells Valley, California,
W74-09352 4B

The Effect of Proposed Deepening of the John F. Baldwin and Stockton Ship Channels on Salt-Water Intrusion, Suisun Bay and Sacramento-San Joaquin Delta Areas, California,
W74-09408 5B

Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology,
W74-09605 4A

GEOLOGICAL SURVEY, PARKVILLE, MD.
Hydrogeology of the Formation and Neutralization of Acid Waters Draining from Underground Coal Mines of Western Maryland,
W74-09369 5B

GEOLOGICAL SURVEY, RESTON, VA.
Floods of 1972,
W74-09391 2E

Recording Floods and Flood Damage,
W74-09397 4A

Probability Distribution of Extreme Floods,
W74-09398 4A

Calibration of U.S. Geological Survey Rainfall/Runoff Model for Peak Flow Synthesis--Natural Basins,
W74-09603 2A

GEOLOGICAL SURVEY, TACOMA, WASH.
The Production, Flow and Distribution of Melt Water in a Glacier Treated as a Porous Medium,
W74-09326 2C

Structure and Inferred Circulation of South Cascade Lake, Washington, U.S.A.,
W74-09349 2C

Urbanized Areas Served by Sewers and Septic Tanks in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09639 7C

Public Water Supplies in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W74-09640 7C

GEOLOGICAL SURVEY, URBANA, ILL.
Cadmium: Mode of Occurrence in Illinois Coals,
W74-09578 5B

GEOLOGICAL SURVEY, WASHINGTON, D.C.
The Worth of Data in Hydrologic Design,
W74-09399 7C

Geohydrology of Crow Creek and Lower Brule Indian Reservations, South Dakota,
W74-09638 7C

GEORGIA UNIV., ATHENS. DEPT. OF HORTICULTURE.
Growth of Subirrigated Japanese Holly as Affected by Soil Type and Depth,
W74-09600 2I

GOETTINGEN UNIV. (WEST GERMANY). SEDIMENT-PETROGRAPHISCHES INSTITUT.
Occurrence of Li, B, Cu, and Zn in Some Egyptian Nile Sediments,
W74-09779 5B

GOVERNMENT INDUSTRIAL RESEARCH INST., SHIKOKU (JAPAN).
Studies on Renovation of Pulp Mill Waste Water: Pilot-Plant Tests for Granular Activated Carbon Adsorption of Kraft Pulp Mill Wastewater (In Japanese),
W74-09457 5D

GREEN BAY METROPOLITAN SEWERAGE DISTRICT, WIS.
Joint Treatment of Municipal and Pulp Mill Effluents,
W74-09473 5D

GRUMMAN ECOSYSTEMS CORP., BETHPAGE, N.Y.
ERTS-1 Virgin Islands Experiment 589--Determine Boundaries of ERTS and Aircraft Data within Which Useful Water Quality Information can be Obtained,
W74-09756 5A

GUELPH UNIV. (ONTARIO).
Nitrogen Losses Through Denitrification and Other Changes in Continuously Aerated Poultry Manure,
W74-09706 5D

GULF SOUTH RESEARCH INST., BATON ROUGE, LA.
Preventing Landfill Leachate Contamination of Water,
W74-09539 5G

HARCO CORP., CLEVELAND, OHIO. CATHODIC PROTECTION DIV.
Fundamentals of Cathodic Protection,
W74-09548 8G

HARZA ENGINEERING CO., CHICAGO, ILL.
Drainage Investigations and Findings on the Gotvand Project - Iran,
W74-09797 2G

HARZA ENGINEERING CO., CHICAGO, ILL. WATER RESOURCES PLANNING DIV.
Stochastic Analysis of Dune Bed Profiles,
W74-09619 2J

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Some Statistical Analyses of Hawaiian Rainfall,
W74-09655 2B

HEBREW UNIV., JERUSALEM (ISRAEL). HUMAN ENVIRONMENTAL SCIENCES PROGRAM.
Membrane Regeneration for Wastewater Reclamation Using Reverse Osmosis,
W74-09554 5D

HERCULES RESEARCH CENTER, WILMINGTON, DEL.
Aerobic Biodegradation of Carboxymethylcellulose,
W74-09442 5B

HIGHWAY RESEARCH BOARD, WASHINGTON, D.C.
Highways and the Catastrophic Floods of 1972.
W74-09390 2E

HULL UNIV., (ENGLAND). DEPT. OF GEOGRAPHY.
Water Movement Through the Gornergletscher,
W74-09329 2C

HURON-MANISTEE NATIONAL FOREST, CADILLAC, MICH.
Canoeist Suggestions for Stream Management in the Manistee National Forest of Michigan,
W74-09404 6B

HYDRAULICS RESEARCH STATION, WALLINGFORD, (ENGLAND).
Comparison of Four Numerical Methods for Flood Routing,
W74-09621 2E

HYDRO PRODUCTS, SAN DIEGO, CALIF.
Underwater Television - Its Development and Future,
W74-09545 7B

HYDROLOGIC ENGINEERING CENTER, WASHINGTON, D.C.
Design Criteria and Research Needs,
W74-09400 4A

HYDRONAUTICS, INC., LAUREL, MD.
An Experimental Study of a Wastewater Treatment System Suitable for Shipboard Use,
W74-09373 5D

ILLINOIS INST. OF TECH., CHICAGO. DEPT. OF ENVIRONMENTAL ENGINEERING.
Septic Tanks and Groundwater Pollution,
W74-09593 5B

ILLINOIS STATE WATER SURVEY, URBANA. WATER QUALITY SECTION.
A Case Study of Chlorine Contact Tank Inadequacies,
W74-09494 5D

ILLINOIS, UNIV., URBANA. DEPT. OF AGRONOMY.
The Land Treatment Process for Wastewater Renovation,
W74-09486 5D

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
Removal of Arsenic (V) from Water by Adsorption on Aluminum and Ferric Hydroxides,
W74-09775 5F

ILLINOIS UNIVERSITY, URBANA. DEPT. OF ANIMAL SCIENCE.
Lead and Vitamin Effects on Heme Synthesis,
W74-09761 5C

IMPERIAL CHEMICAL INDUSTRIES LTD., RUNCORN (ENGLAND). MOND DIV.
Some Lessons From Model and Full-Scale Tests in Rectangular Sedimentation Tanks,
W74-09736 5D

INDIANA UNIV., BLOOMINGTON. SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS.
Alternative Strategies for Managing Wastewater,
W74-09712 5D

INNSBRUCK UNIV. (AUSTRIA). DEPT. OF PHYSICS.
Seasonal Variations in the Tritium Activity of Run-Off from an Alpine Glacier (Kesselwandferner, Oetztal Alps, Austria),
W74-09341 2C

INST. OF REHABILITATION MEDICINE. UNIV. MEDICAL CENTER, N.Y.
Zinc and Cadmium in Normal Human Embryos and Fetuses, Analyses by Atomic Absorption Spectrophotometry,
W74-09785 5C

INSTITUT FUER ZELLSTOFF UND PAPIER, HEIDENAU (EAST GERMANY).
Studies on Internal Reuse of Sulfite Evaporator Condensates (Untersuchungen zur innerbetrieblichen Wiederverwending von Sulfitablaugeneindampfkondensaten),
W74-09453 5D

INSTITUT ZA BOTANIKU, ZAGREB (YUGOSLAVIA).
Ecological Investigation of Eubacteria and Actinomycetes in Aquatic and Terrestrial Biotopes of Croatia (In Serbo-Croatian),
W74-09351 5B

INSTITUT ZEMNOI KORY, IRKUTSK (USSR).
Outline of the Hydrogeology of Siberia (Ocherki po gidrogeologii Sibiri).
W74-09641 2F

Subsurface Flow into Lake Baykal Basin (Podzemnyy stok basseyna oz. Baykal),
W74-09642 2H

Present State and Prospects of Groundwater Use for Water Supply of Populated Areas in Irkutsk Oblast (Sostoyaniye i perspekitivy ispol'zovaniya podzemnykh vod dlya vodosnabzheniya obzhitoy chasti Irkutskoy oblasti),
W74-09643 4B

INSTITUT ZEMNOI KORY, IRKUTSK (USSR).

Present State and Prospects of Use of Therapeutic Mineral Waters in the Irkutsk Oblast (Sostoyaniye i perspektivy ispol'zovaniya lechebnykh mineral'nykh vod Irkutskoy oblasti),
W74-09644 2K

Mineral Waters of Nilovaya Pustyn', Their Regime and Resources (Mineral'nyye vody Nilovoy Pustyni, ikh rezhim i resursy),
W74-09645 2K

Mineral Lakes of Tuva (Mineral'nyye ozera Tuvy),
W74-09646 2H

Problems of Hydrogeologic Investigations in the Eastern Part of the USSR in 1971-75 (Zadachi gidrogeologicheskikh issledovaniy na Vostoke SSSR na 1971-1975 gg),
W74-09647 4B

INSTITUTE FOR MARINE ENVIRONMENTAL RESEARCH, LOWESTOFT (ENGLAND). FISHERIES LAB.
Mercury and Other Metals in British Seals,
W74-09571 5B

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL. DIV. OF BIOENGINEERING RESEARCH.
Kinetics of Substrate Assimilation and Product Formation in Anaerobic Digestion,
W74-09440 5B

INSTITUTE OF GEOGRAPHY, USSR ACADEMY OF SCIENCES, MOSCOW.
Infiltration and Run-off of Melt Water on Glaciers,
W74-09347 2C

INTER-AMERICAN TROPICAL TUNA COMMISSION, LA JOLLA, CALIF.
Mercury in Tunas: A Review,
W74-09574 5B

INTERNATIONAL ENGINEERING CO., INC., DENVER, COLO. BARTON, STODDARD, MILHOLLIN AND HIGGINS DIV.
River Regulations as Influence on Peak Discharge,
W74-09617 4A

INTERNATIONAL JOINT COMMISSION-UNITED STATES AND CANADA.
Report on Great Lakes Water Quality for 1972.
W74-09257 5G

INTERNATIONAL PAPER CO., TICONDEROGA, N. Y. SOLID WASTE MANAGEMENT.
Paper Industry and Environmental Quality,
W74-09475 5D

IOWA STATE DEPT. OF HEALTH, DES MOINES.
Application of Iowa's Water Pollution Control Law to Livestock Operations,
W74-09668 5G

IOWA STATE UNIV., AMES.
Storage of Manure Solids by Forming Soil-Manure Pellets,
W74-09679 5D

Automated Hydraulic Waste-Handling System for a 700-Head Swine Facility Using Recirculated Water,
W74-09682 5D

An Evaluation of Three Hydraulic Manure Transport Treatment Systems, Including a Rotating Biological Contactor, Lagoons and Surface Aerators,
W74-09685 5D

JOHN CURTIN SCHOOL OF MEDICAL RESEARCH, CANBERRA (AUSTRALIA). DEPT. OF EXPERIMENTAL PATHOLOGY.
Granules Containing Lead in Isolated Mitochondria,
W74-09787 5C

JOHNS-MANVILLE CORP., DENVER, COLO.
Installation of Large-Diameter Fiber-Glass Flexible Pipe in Municipal Systems,
W74-09727 8A

KALAMAZOO DEPT. OF PUBLIC WORKS, MICH.
Thermal Sludge Conditioning in Kalamazoo, Michigan,
W74-09439 5D

KANSAS STATE UNIV., MANHATTAN.
Effects of Solid Beef Feedlot Wastes on Soil Conditions and Plant Growth,
W74-09699 5D

KAPPE ASSOCIATES, INC., ROCKVILLE, MD.
Development of a System and a Method for the Treatment of Runoff from Cattle Holding Areas,
W74-09692 5D

KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER SIEDLUNGSWASSERWIRTSCHAFT.
Hydraulics of a Water Supply System with Fluctuating Water Demand, (Hydraulik eines Wasserversorgungssystems mit fluktuierenden Bedarfsmengen),
W74-09726 8B

KAROLINSKA INSTITUTET, STOCKHOLM (SWEDEN). DEPT. OF ENVIRONMENTAL HYGIENE.
Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source, A Comparative Study Using Flameless Atomic Absorption and Neutron Activation Analysis,
W74-09758 5C

KENTUCKY UNIV., LEXINGTON. DEPT. OF GEOLOGY.
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-09543 4B

KIEL UNIV. (WEST GERMANY).
Aerobic Treatment of Swine Waste by Aerator-Agitators ('Fuchs'),
W74-09705 5D

KNAPSACK A. G., COLOGNE (WEST GERMANY).
The Phosphate Precipitation in Communal Waste Waters (Die Phosphat-Faellung in kommunalem Abwasser),
W74-09521 5D

KYOTO UNIV., (JAPAN). DEPT. OF HYGIENE.
Bone Changes in Experimental Chronic Cadmium Poisoning, Radiological and Biological Approaches,
W74-09576 5C

KYUSHU UNIV., FUKUOKA (JAPAN). WOOD CHEMISTRY LAB.
On Spent of Liquor Semichemical Pulping. Part III. Toxicity Characteristics of SCP Spent Liquor and Reduction of the Toxicity (In Japanese),
W74-09454 5C

LAMAR UNIV., BEAUMONT, TEX. DEPT. OF CHEMISTRY.
A Survey of Trace Metals in Human Hair,
W74-09573 5B

LITTLE (ARTHUR D.), INC., CAMBRIDGE, MASS. PUBLIC AFFAIRS CENTER.
Road Salt, Drinking Water and Safety,
W74-09537 4C

LIVINGSTON COLL., NEW BRUNSWICK, N.J.
A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4-Digit Standard Industrial Code Levels,
W74-09551 3E

LONG ISLAND UNIV., GREENVALE, N.Y. SCIENCE ENGINEERING RESEARCH GROUP.
An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W74-09602 5B

LOS ANGELES COUNTY SANITATION DISTRICT, CALIF.
Dewatering Digested Primary Sludge,
W74-09441 5D

LOUISIANA ADVISORY COMMISSION ON COASTAL AND MARINE RESOURCES, BATON ROUGE.
Thibodaux Public Hearing Testimony.
W74-09288 6E

LOUISIANA TECH. UNIV., RUSTON. DEPT. OF AGRICULTURAL ENGINEERING.
Groundwater Pollution by Agriculture,
W74-09595 5B

LOUISVILLE UNIV., KENTUCKY. DEPT. OF CIVIL ENGINEERING.
Geologic Aspects of Landfill Refuse Disposal,
W74-09375 5B

LOUVAIN UNIV. (BELGIUM). UNITE DE TOXICOLOGIE INDUSTRIELLE ET MEDICALE.
Occupational Exposure to Mercury Vapors and Biological Action,
W74-09793 5C

LUCKNOW UNIV. (INDIA). DEPT. OF ZOOLOGY.
Studies on Trematode Parasites of Luckow (India): I,
W74-09530 2I

MACQUARIE UNIV., NORTH RYDE (AUSTRALIA).
Churchill Falls--The Costs and Benefits of a Hydro-Electric Development Project,
W74-09562 6B

MAINE COOPERATIVE FISHERY UNIT, ORONO.
The Effects of Water Flow Manipulation Below the Hydroelectric Power Dam on the Bottom Fauna of the Upper Kennebec River, Maine,
W74-09462 5C

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF NUTRITION AND FOOD SCIENCE.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-09766 5C

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF URBAN STUDIES AND PLANNING.
Land-Use Research Issues Suggested by a National Urban Growth Strategy,
W74-09415 4A

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. RALPH M. PARSONS LAB. FOR WATER RESOURCES AND HYDRODYNAMICS.
Simulation Criteria for Selecting Water Resource System Alternatives,
W74-09567 6A

A General Purpose Simulation Model for Analysis of Surface Water Allocation Using Large Time Increments,
W74-09568 6A

MASSACHUSETTS UNIV., AMHERST., AND IOWA UNIV., IOWA CITY.
Low-Pressure Ultrafiltration Systems for Wastewater Contaminant Removal,
W74-09634 5D

MASSACHUSETTS UNIV., AMHERST. DEPT. OF GEOLOGY.
Some Potential Environmental Problems from Population Explosion and Urban Development in Massachusetts and Adjacent Parts of New England,
W74-09598 5B

MASSACHUSETTS UNIV., AMHERST. DEPT. OF LANDSCAPE ARCHITECTURE.
Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts,
W74-09651 6B

MASSACHUSETTS UNIV., AMHERST. DEPT. OF PLANT AND SOIL SCIENCES.
Heavy Manure Applications: Benefit or Waste,
W74-09698 5D

MECHANICS RESEARCH, INC., LOS ANGELES, CALIF.
Vacuum Desorption Concept for Removing Oil from Water,
W74-09323 5G

META SYSTEMS, INC., SPRINGFIELD, VA.
Optimal Design for Highway Drainage Culverts,
W74-09630 4A

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
Stability and Control of Anaerobic Digestion,
W74-09434 5D

MIAMI UNIV., CORAL GABLES, FLA. DEPT. OF BIOLOGY.
Effects of a Natural Fish Kill on the Water Quality, Plankton, and Fish Population of a Pond in the Big Cypress Swamp, Florida,
W74-09448 5C

MIAMI UNIV., FL. SEA GRANT PROGRAM.
The Commercial Feasibility of Rearing Pompano, Trachinotus carolinus (Linnaeus), in Cages,
W74-09566 8I

MIAMI UNIV., FLA.
The Coastal Interceptor Waterway,
W74-09614 5G

MIAMI UNIV., FLA. OCEAN LAW PROGRAM.
Florida's Seaward Boundaries--A Dilemma,
W74-09281 6E

Appraisal of Aquatic Preserves in Florida,
W74-09285 6E

MIAMI UNIV., FLA. SEA GRANT INSTITUTIONAL PROGRAM.
The Use of Ocean Outfalls for Marine Waste Disposal in Southeast Florida's Coastal Waters,
W74-09403 5D

MICHIGAN STATE UNIV., EAST LANSING.
The Effects of Continuous Recycling and Storage on Nutrient Quality of Dehydrated Poultry Waste (DPW),
W74-09687 5D

Initial Observations of Several Medium Sized Barriered Landscape Water Renovation Systems for Animal Wastes,
W74-09695 5D

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF CROP AND SOIL SCIENCES.
Aqua Regia for Quantitative Recovery of Mercuric Sulfide from Sediments,
W74-09763 5A

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF ZOOLOGY.
Ecological Concepts and Applications to Planning,
W74-09418 6B

MIDWEST RESEARCH INST., KANSAS CITY, MO.
Pyrolysis as a Method of Disposal of Cattle Feedlot Wastes,
W74-09673 5D

MINNESOTA DEPT. OF HEALTH, MINNEAPOLIS.
Survey of Environmental Radioactivity, (January 1973-December 1973).
W74-09431 5A

MINNESOTA STATE HIGHWAY DEPT., MINNEAPOLIS.
Floods in Minnesota,
W74-09395 2E

MINNESOTA UNIV., ST. PAUL. WATER RESOURCES RESEARCH CENTER.
Water Resources Problems and Research Needs in Minnesota, 1974 - Guidelines for Research Programs,
W74-09656 6B

MISSOURI UNIV., COLUMBIA.
A Review of Public and Private Livestock Waste Regulations,
W74-09669 5G

MISSOURI UNIV., KANSAS CITY. DEPT. OF BIOLOGY.
Limnological Studies of Lake Jacomo, Jackson County, Missouri. II. The Dynamics of the Macrobenthos and Its Relationship to Water Quality and Plankton Distribution in Lakes Jacomo and Prairie Lee, with a Note on the Sport Fishery, 1971-1972,
W74-09660 5C

MONASH UNIV., CLAYTON (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Independent Comparison of Three Urban Runoff Models,
W74-09629 2A

MONROEVILLE WATER AUTHORITY, PA.
Computer Data Flows Smoothly for Small Water Authority,
W74-09483 6C

MONTREAL ENGINEERING CO. CO. LTD. (QUEBEC).
Simulation Accuracies of Gradually Varied Flow,
W74-09628 8B

MOSCOW STATE UNIV., (USSR).
Analysis of the Run-Off and Flow Routing for a Mountain Glacier Basin,
W74-09328 2C

NAGOYA UNIV. (JAPAN). WATER RESEARCH LAB.
On the Possibility of Artificial Control of the Mass Balance of a Perennial Snow Patch,
W74-09342 2C

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ALBUQUERQUE, N. MEX.
Pollutant Transport and Accumulation Processes in Our Environment--The General Theory and a Case Study of Mercury from the Four Corners Electric Power Plants and in Navajo Lake, New Mexico,
W74-09597 5B

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ENVIRONMENTAL TOXICOLOGY RESEARCH DIV.
Gastrointestinal Absorption of Different Compounds of 115m Cadmium and the Effect of Different Concentrations in the Rat,
W74-09778 5C

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. WATER SUPPLY RESEARCH LAB.
Mercury Removal by Conventional Water-Treatment Techniques,
W74-09773 5F

NATIONAL INST. OF INDUSTRIAL HEALTH, KAWASAKI (JAPAN). DEPT. OF OCCUPATIONAL DISEASES.
Isolation of (Beta Sub 2)-Microglobulin from the Urine of Patients with Itai-Itai (Ouch-Ouch) Disease,
W74-09771 5A

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N.C. ATLANTIC ESTUARINE FISHERIES CENTER.
Standing Crops of Aquatic Organisms in Tidal Streams of the Lower Cooper River System, South Carolina,
W74-09380 2L

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. NORTHWEST FISHERIES CENTER. ENVIRONMENTAL CONSERVATION DIVISION.
Northwest Fishery Center Research on Effects of Environmental Contaminants on Marine Organisms,
W74-09572 5C

NATIONAL MILK PRODUCERS FEDERATION, WASHINGTON, D.C.
Dairy Farmer Concerns of Laws and Regulations Affecting Animal Waste Management,
W74-09672 5G

NATIONAL OCEAN SURVEY, DETROIT, MICH.
Great Lakes Ice Cover, Winter 1971-72,
W74-09588 2C

NATIONAL PARKS AND CONSERVATION ASSOCIATION, WASHINGTON, D.C.
Ecological River Basin Management,
W74-09559 4A

NATIONAL PETROLEUM COUNCIL, WASHINGTON, D.C.
Supply-Economic Relationships of Offshore Petroleum Operations,
W74-09552 3E

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C.
Environment: A New Focus for Land-Use Planning.
W74-09412 4A

NATIONAL WATER AND SOIL CONSERVATION ORGANIZATION, WELLINGTON (NEW ZEALAND).
Calculation of Natural Catchment Infiltration by Computer,
W74-09367 7C

A General Purpose Event Water-Level Recorder,
W74-09604 7B

NATIONAL WATER COMMISSION, ARLINGTON, VA.
A Summary-Digest of Federal Water Laws and Programs,
W74-09318 6E

NATIONAL WATER QUALITY LAB., DULUTH, MINN.
Toxicity of Sodium Nitrilotriacetate (NTA) to the Fathead Minnow and an Amphipod in Soft Water,
W74-09432 5C

NATIONAL WATER WELL ASSOCIATION, HOUSTON, TEX. RESEARCH FACILITY.
O and M Costs: Pay Now or Pay Later,
W74-09533 4B

NATIONAL WEATHER SERVICE, SILVER SPRING, MD.
Weather Situations Associated with Floods During 1972,
W74-09392 2E

NAVAL COASTAL SYSTEMS LAB, PANAMA CITY, FLA.
Helicopter Tow Tests of the U.S. Coast Guard's Air Delivery Container for Oil Spill Containment Barrier,
W74-09374 5G

NAVY WEATHER RESEARCH FACILITY, NORFOLK, VA.
Results Generated from a One-Dimensional Warm Fog Model Which Simulates Hygroscopic Seeding,
W74-09322 3B

NEVADA UNIV., RENO. CENTER FOR WATER RESOURCES RESEARCH.
Hydrologic Data Storage and Retrieval System,
W74-09401 7C

NEW MEXICO UNIV., ALBUQUERQUE. ERIC H. WANG CIVIL ENGINEERING RESEARCH FACILITY.
Disposal of Aircraft Washrack Waste Water,
W74-09376 5D

Treatment of Electroplating Wastes by Ion Exchange,
W74-09377 5D

NEW YORK STATE DEPT. OF HEALTH, ALBANY. DIV. OF LABS. AND RESEARCH.
Nutrients and Aquatic Vegetation Effects,
W74-09498 5C

NEW YORK STATE UNIV., BUFFALO. DEPT. OF CIVIL ENGINEERING.
Estimation of Washload Produced on Certain Small Watersheds,
W74-09618 2J

NEWCASTLE AND GATESHEAD WATER CO., NEWCASTLE-UPON-TYNE (ENGLAND).
Chemistry of Modern Water Chlorination, I, Introduction, II, the Chemistry of Chlorination,
W74-09744 5D

Chemistry of Modern Water Chlorination, III, Disinfection by Chlorine, IV, Chlorination of Wastewater and Industrial Waters,
W74-09745 5D

NEWCASTLE-UPON-TYNE UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Glacial Origin of Pro-Glacial Boulders,
W74-09336 2C

NORTH CAROLINA BOARD OF WATER AND AIR RESOURCES, RALEIGH.
Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section III, Kinston Public Hearing March 1, 1973.
W74-09275 4A

Report of Proceedings Concerning the Reclassification of Various Streams in North Carolina, Section II, Southern Pines Public Hearings November 2, 1972.
W74-09276 4A

NORTH CAROLINA STATE UNIV., RALEIGH.
Evaluation of Swine Waste Treatment Alternatives,
W74-09691 5D

American Cockroach Feeding in Sewer Access Shafts on Paraffin Baits Containing Propoxur or Kepone Plus a Mold Inhibitor,
W74-09717 5G

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
Economics of Alternative Wastewater Treatment Systems,
W74-09427 5D

Irrigation Cost for Land Disposal,
W74-09428 5D

Treatment Systems for Animal, Agricultural and Municipal Wastes,
W74-09430 5D

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CIVIL ENGINEERING.
Pollution of Groundwater by Salt Invasion,
W74-09594 5B

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF ECONOMICS.
Costs and Returns of Land Spreading Wastwater,
W74-09429 5D

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF SOIL SCIENCE.
Management of Lands Used for Waste Disposal,
W74-09424 5D

Wastewater and Soil Interaction,
W74-09425 5D

NORTH CAROLINA STATE UNIV., RALEIGH. WATER RESOURCES RESEARCH INST.
Proceedings-Workshop on Land Disposal of Wastewaters.
W74-09422 5D

NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH.
Water Resource Problems and Research Needs of North Carolina - A Reassessment,
W74-09657 6B

NORTH DAKOTA UNIV., GRAND FORKS. DEPT. OF BIOLOGY.
Full-Scale Harvest of Aquatic Plants: Nutrient Removal from a Eutrophic Lake,
W74-09438 5G

NORTH DAKOTA UNIV., GRAND FORKS. DEPT. OF CIVIL ENGINEERING.
Water Balance in Sewage Stabilization Lagoons,
W74-09361 5D

NORTHEASTERN FOREST EXPERIMENT STATION, PRINCETON, W.VA.
Physical and Chemical Characteristics of Surface Mine Spoil Treated with Fly Ash,
W74-09631 5B

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF MATERIALS SCIENCE.
Can a Water-Filled Crevasse Reach the Bottom Surface of a Glacier,
W74-09335 2C

NOTRE DAME UNIV., IND.
Coagulation of Stormwaters and Low Alkalinity Wastewaters,
W74-09738 5D

OAK RIDGE NATIONAL LAB., TENN.
A Preliminary Investigation of Radiation-Enhanced Oxidation of Pulp Mill Effluents for Color Reduction,
W74-09464 5D

OFFICE OF SALINE WATER, WASHINGTON, D.C.
Final Environmental Statement, (Office of Saline Water)--Five Year Extension Research and Development, Public Law 92-60.
W74-09280 3A

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, WORSTER.
Beef Barnlot Runoff and Stream Water Quality,
W74-09681 5B

OHIO DEPT. OF HEALTH, COLUMBUS. DIV. OF SANITATION.
Water Supply Improvement Project,
W74-09542 5B

OHIO RIVER VALLEY SANITATION COMMISSION, CINCINNATI. COMMITTEE ON SUBSURFACE INDUSTRIAL WASTEWATER INJECTION.
Underground Injection of Wastewaters in the Ohio Valley Region.
W74-09324 5G

OHIO STATE UNIV., COLUMBUS.
Automated Handling and Treatment of Swine Wastes,
W74-09690 5D

OHIO STATE UNIV., RESEARCH FOUNDATION, COLUMBUS. INST. FOR POLAR STUDIES.
Jerky Glacier Motion and Melt Water,
W74-09339 2C

OHIO UNIV., ATHENS. DEPT. OF GEOLOGY.
Coal Mining and Its Effect on Water Quality,
W74-09592 5B

OKLAHOMA STATE UNIV., STILLWATER.
Evaluation of Beef Waste Management Alternatives,
W74-09693 5D

OKLAHOMA UNIV. HEALTH SCIENCES CENTER, OKLAHOMA CITY. DEPT. OF ENVIRONMENTAL HEALTH.
Cadmium Toxicity and Biocentration in Largemouth Bass and Bluegill,
W74-09492 5C

OLD DOMINION UNIV., NORFOLK, VA. INST. OF OCEANOGRAPHY.
Tidal Currents, Sediment Transport, and Sand Banks in Chesapeake Bay Entrance, Virginia,
W74-09368 2L

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO.
Treatment and Disposal of Chemical Phosphate Sludge in Ontario,
W74-09447 5D

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL ENGINEERING.
Agricultural Waste Management,
W74-09504 5D

OREGON STATE UNIV., CORVALLIS. DEPT. OF FOREST ENGINEERING.
Energy Flux Studies in a Confierous Forest Ecosystem,
W74-09615 2D

ORGANIZATION STANFORD UNIV., CALIF.
Continuous Simulation Models in Urban Hydrology,
W74-09479 3D

PALLI SIKSHA SADANA, SRINIKETAN (INDIA). DEPT. OF CHEMISTRY.
Studies of Solvent Extraction Behavior of Some Divalent Metals with Liquid Ion-Exchanger,
W74-09783 5A

PASADENA BAYSHORE HOSPITAL, TEX.
Nickel Carbonyl Poisoning, Report of a Fatal Case,
W74-09786 5C

PAUL SABATIER UNIV., TOULOUSE (FRANCE). LAB. OF BOTANY AND BIOGEOGRAPHY.
Water and Land Slides,
W74-09485 4A

PENNSYLVANIA STATE DEPT. OF TRANSPORTATION, HARRISBURG.
Hurricane Agnes-Damage in Pennsylvania,
W74-09393 2E

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Contribution of Animal Waste to Nitrate Nitrogen in Soil,
W74-09697 5B

PENNSYLVANIA UNIV., PHILADELPHIA. WHARTON SCHOOL.
Effluent Charges: A Critique,
W74-09560 5G

PITTSBURGH UNIV., PA. DEPT. OF PATHOLOGY.
Beryllium-Induced Ultrastructural Changes in Intact and Regenerating Liver,
W74-09769 5C

POLLUTION CONTROL ENGINEERING, INC., DOWNEY, CALIF. (ASSIGNEE).
Apparatus for Treating Waste Fluids by Means of Dissolved Gases,
W74-09721 5D

PRECISION PLUMBING PRODUCTS, INC., PORTLAND, OREG. (ASSIGNEE).
Priming Unit for Distributing Priming Water to Multiple Sewer Line Water Traps,
W74-09732 5D

PUBLIC HEALTH SERVICE, WASHINGTON, D.C.
Clean Water--A Challenge to the Nation, Highlights and Recommendations of the National Conference on Water Pollution.
W74-09260 5G

PUERTO RICO UNIV., MAYAGUEZ. DEPT. OF CIVIL ENGINEERING.
Effects of Salinity and Suspended Sediment on Turbulent Diffusion of Pollutant in Puerto Rico,
W74-09362 5B

QUEBEC MINISTERE DE L'AGRICULTURE ET DE LA COLONISATION, BUCKINGHAM.
Delays in the Operation of Subsurface Drainage Trenching Machines,
W74-09794 8C

RALPH STONE AND COMPANY, INC., LOS ANGELES, CALIFORNIA.
Wastewater Reclamation: Socio-economics, Technology, and Public Acceptance.
W74-09662 5D

RANDSE AFRIKAANSE UNIVERSITEIT, JOHANNESBURG (SOUTH AFRICA). NAVORSINGSGROEP VARSWATERBIOL.
An Investigation into Age and Length/Mass Relationship of Tilapia Mossambica Peters (Pisces: Chichlidae) in the Loskop Dam Reservoir, Eastern Transvaal,
W74-09754 8I

Notes on the Ratio Total Length/Scale Radius of Tilapia Mossambica Peters (Pisces:Cichlidae) in the Loskop Dam Reservoir Eastern Transvaal,
W74-09768 8I

Notes on the Condition Factor for Tilapia mossambica Peters (Pisces:Cichlidae) in Loskop Dam Reservoir, Eastern Transvaal,
W74-09781 8I

REGIONAL PLAN ASSOCIATION, N.Y.
Waste Management: Generation and Disposal of Solid, Liquid and Gaseous Wastes in the New York Region,
W74-09353 5G

RHODE ISLAND UNIV., KINGSTON. DEPT. OF CHEMISTRY.
Laser Raman Spectroscopy of Solutes Dissolved in Water from a Remote Platform,
W74-09255 5A

RHODE ISLAND UNIV., KINGSTON. DEPT. OF MICROBIOLOGY.
Biological Degradation of Hydrocarbons in Water,
W74-09254 5B

ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB., ADA, OKLA.
An Objective Water Quality Index,
W74-09436 5G

ROCHESTER UNIV. MEDICAL CENTER, N.Y. DEPT. OF RADIATION BIOLOGY AND BIOPHYSICS.
Excretion and Absorption of Methyl Mercury After Polythiol Resin Treatment,
W74-09575 5C

ROCHESTER UNIV., N.Y. DEPT. OF PSYCHOLOGY.
Hand Tremor Induced by Industrial Exposure to Inorganic Mercury,
W74-09789 5C

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION, LARAMIE, WYO.
Evaporation Losses of Windblown Snow, and the Potential for Recovery,
W74-09611 2D

ROSS, HARDIE, O'KEEFE, BABCOCK, MCDUGALD AND PARSONS, CHICAGO, ILL.
Conflicts in Land Use,
W74-09416 4A

ROTHSCHILD (L.F.) AND CO., N.Y.
Pollution Control: New Method of Financing,
W74-09563 5G

S. N. MEDICAL COLL., AGRA (INDIA).
Bacteriological Water Quality and Incidence of Waterborne Diseases in a Rural Population,
W74-09540 5C

SAFFORD MUNICIPAL UTILITIES, ARIZ.
Oxidation and Aerated Lagoon Operation,
W74-09452 5D

SAN FRANCISCO WATER DEPT., CALIF.
Managing Water Resources: Basic Considerations and Problems,
W74-09734 6B

SANDIA LABS., ALBUQUERQUE, N. MEX. TERRADYNAMICS DIV.
Depth Prediction for Earth-Penetrating Projectiles,
W74-09534 8D

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Chemical Descriptions of the Oceans,
W74-09570 5B

SHEFFIELD UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Variation in Width-Discharge Relation and Some Implications for Hydraulic Geometry,
W74-09632 8B

SHELL RESEARCH LTD., SITTINGBOURNE (ENGLAND). WOODSTOCK AGRICULTURAL RESEARCH CENTRE.
Some Practical Aspects Concerning the Use of The Molluscicide N-Tritylmorpholine (Frescon) for the Control of Fascioliasis,
W74-09525 5C

SHIZUOKA UNIV. (JAPAN). FACULTY OF SCIENCE.
Surface Sediments in Hamana Lake, the Pacific Coast of Central Japan,
W74-09751 2H

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Hydrographic Framework of the Doboy Sound Estuary and Surveys of the Other Tidal Inlets Along the Coast of Georgia,
W74-09582 2L

Chemical Survey of Waters Adjacent to Colonels Island, Glynn County, Georgia,
W74-09584 5A

SOIL CONSERVATION SERVICE, ANCHORAGE, ALASKA.
A Comparison of Techniques of Sampling the Arctic-Subarctic Snowpack in Alaska,
W74-09609 2C

SOUTH CAROLINA POLLUTION CONTROL AUTHORITY, COLUMBIA.
Charleston Area Sediment Samples,
W74-09386 5A

SOUTH CAROLINA UNIV., COLUMBIA.
Vertical Distribution of Epiphytic Algae on Spartina alterniflora from Transects Along the Cooper and Wando Rivers,
W74-09381 2L

Vascular Plant Survey of Marsh and Adjacent Highland in Selected Portions of Cooper River and Wando River,
W74-09382 2L

The Vegetation of the Cooper River Estuary,
W74-09383 2L

SOUTH DAKOTA STATE DEPT. OF HIGHWAYS, PIERRE.
Flood Damage in South Dakota,
W74-09394 2E

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF PLANT SCIENCES.
Water Loss Estimates from a Fallow Soil,
W74-09546 2D

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
The Environmental Impact Concept, and Its Effect on the National Gas Industry,
W74-09489 5C

SREDNEASIATSKII NAUCHNO-ISSLEDOVATELSKII GIDROMETEOROLOGICHESKII INSTITUT, TASHKENT (USSR).
Hydrological Regime of Glaciers in the Alay Range, Central Asia,
W74-09346 2C

STAMM-SCHEELE, INC., RAYNE, LA.
Operation and Maintenance of Wells,
W74-09524 8G

STANFORD UNIV., CALIF. DEPT. OF GEOLOGY.
Optimal Pumping for Aquifer Dewatering,
W74-09620 4B

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CIVIL ENGINEERING.
Lake Ontario Hydraulic Model Study (Preliminary Results),
W74-09402 2H

SUSQUEHANNA RIVER BASIN COMMISSION, MECHANICSBURG, PA.
Ground-Water Conditions Caused by Tropical Storm Agnes,
W74-09532 4B

TAIWAN INST. OF ENVIRONMENTAL SANITATION, TAIPEI. WATER QUALITY CONTROL SECTION.
Study of Arsenic Removal from Drinking Water,
W74-09776 5F

TASMAN VACCINE LAB. LTD., POOLE (ENGLAND). ECOTECH SYSTEMS DIV.
Protein Recovery from Process Effluents using Ion-Exchange Resins,
W74-09747 5D

TECHNISCHE HOCHSCHULE, VIENNA. (AUSTRIA). INSTITUT FUER WASSERVERSORGUNG ABWASSERREININGUNG UND GEWASSERSCHUTS.
Pulp Mill Waste Waters: Discharge and Purification (Zellstoffabwaesser: Anfall and Reinigung),
W74-09455 5D

TECHNISCHE UNIVERSITAET, DARMSTADT (WEST GERMANY). WASSER- UND ABWASSERFORSCHUNGSSTELLE.
Cleaning Paper Industry Effluents by Means of Activated Carbon (Ueber die Reinigung papierindustrieller Restabwaesser mittels Aktivkohle),
W74-09450 5D

TENNESSE VALLEY AUTHORITY, MUSCLE SHOALS, ALA. ENVIRONMENTAL BIOLOGY BRANCH.
Mussels of the Elk River Basin in Alabama and Tennessee: 1965-1967,
W74-09737 2I

TENNESSEE VALLEY AUTHORITY, CHATTANOOGA.
Bear Creek Project, Tennessee (Final Environmental Statement).
W74-09271 4A

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF AGRICULTURAL ENGINEERING.
Time It Right,
W74-09795 3F

TEXAS A AND M UNIV., COLLEGE STATION. INDUSTRIAL ECONOMICS RESEARCH DIV.
Economic Development Study of the Texas Coastal Zone,
W74-09569 6B

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
Decision Analysis on Water Resources Planning and Management for an Arid Metropolitan Center in West Texas,
W74-09364 6A

TEXAS A AND M UNIV., COLLEGE STAZTION. WATER RESOURCES INST.
Alternative Solutions to Water Resource Development--A Case Study,
W74-09661 6B

TEXAS LAW INST. OF COASTAL AND MARINE RESOURCES, HOUSTON.
Recent Federal Legislation Significant in Environmental Planning Programs of the State of Texas.
W74-09316 6E

TEXAS TECH UNIV., LUBBOCK.
Characteristics of Wastes from Southwest Beef Cattle Feedlots,
W74-09694 5D

TEXAS UNIV., AUSTIN. DEPT. OF CIVIL ENGINEERING.
Kinetics of Activated Sludge Oxygenation,
W74-09437 5D

TEXAS UNIV., DALLAS, INST. FOR GEOLOGICAL SCIENCES.
Significance of Lead Isotope Composition in Blood,
W74-09772 5A

TEXAS WATER DEVELOPMENT BOARD, AUSTIN. COASTAL ZONE STUDIES BRANCH AND SYSTEMS ENGINEERING DIV.
The Effects of Water Resources Development on Estuarine Environments,
W74-09556 2L

TOKYO SCIENCE UNIV. (JAPAN).
Discharge Coefficients of Float-Area-Type Flow Meters,
W74-09480 2E

TOMSK POLYTECHNIC INST. (USSR).
Antimony in Groundwater of the Kadamdzhay Deposit (Sur'ma v podzemnykh vodakh Kadamdzhayskogo mestorozhdeniya),
W74-09648 4B

TORONTO UNIV. (ONTARIO).
A Study of Foaming Problems in an Oxidation Ditch Treating Swine Waste,
W74-09703 5D

TORONTO UNIV. (ONTARIO). DEPT. OF PHYSIOLOGY.
Brain Aluminum Distribution in Alzheimer's Disease and Experimental Neurofibrillary Degeneration,
W74-09579 5C

TORONTO UNIV. (ONTARIO). FACULTY OF FORESTRY.
The Influence of Draw-Down on Recreation on the Trent Canal Reservoir-Lakes,
W74-09555 4A

UKRAINIAN RESEARCH INST. OF THE FISH INDUSTRY, KIEV (USSR).
Philometra lusiana from Fishes of the Kremenchug Reservoir, USSR, (In Russian),
W74-09449 2H

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
A Hybrid Automatic Analyser,
W74-09622 5A

An Adapted Determination of Phosphate in Seawater for Use with the Hybrid Automatic Analyser,
W74-09623 5A

Studies of the Seasonal Variation of the Suspended Matter of the Menai Straits. II. Mid Stream Data,
W74-09741 5B

UPPSALA UNIV. (SWEDEN). DEPT. OF PHYSICAL GEOGRAPHY.
Some Viewpoints on the Internal Drainage of Glaciers,
W74-09333 2C

VERMONT UNIV., BURLINGTON. REMOTE SENSING LAB.
Application of ERTS-1 Imagery in the Vermont-New York Dispute Over Pollution of Lake Champlain,
W74-09585 5B

VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF BACTERIOLOGY AND BIOCHEMISTRY.
An Initial Evaluation of Ethylene Oxide for the Sterilization of Formulated and Pelleted Fish Feeds,
W74-09723 2I

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Development of the Turbidity Maximum in a Coastal Plain Estuary,
W74-09587 2L

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR URBAN AND REGIONAL STUDIES.
Minimizing Water and Sewer System Costs Using Topaz,
W74-09658 6A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRONOMY.
Effect of Detergent-Laden Water on the Growth of Corn,
W74-09256 3C

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL). DEPT. OF AGRONOMY.
On the Pressure Chamber Technique for Estimating Leaf Water Potential in Sorghum,
W74-09730 3F

WALES DIRECTORATE OF ENGINEERING (ENGLAND).
Water Pollution Prevention in South Wales,
W74-09735 5G

WARREN SPRING LAB., STEVENAGE (ENGLAND).
Solvent Extraction in Processes for Metal Recovery from Scrap and Waste,
W74-09784 5D

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Particulate Lead Contamination Recorded in Sedimentary Cores From Lake Washington, Seattle,
W74-09791 5B

WATER RESOURCES COUNCIL, WASHINGTON, D.C.
Principles and Standards for Planning Water and Related Land Resources.
W74-09278 4A

Principles and Standards for Planning Water and Related Land Resources (Final Environmental Statement).
W74-09279 4A

WATER SUPPLY MANAGEMENT, BARRINGTON, ILL.
(Water Well Contractor Survey).
W74-09529 4B

WATER SURVEY OF CANADA, OTTAWA (ONTARIO).
Simple Method of Measuring the Average Amount of Water Produced Annually by Melting of Ice on a Glacier,
W74-09343 2C

WATERLOO UNIV. (ONTARIO). DEPT. OF BIOLOGY.
On the Characterization of the Parasite Fauna of Yellow Perch (Perca fluviatilis L.) in Five Lakes, in Southern Ontario, Canada,
W74-09541 5B

WATERLOOPKUNDIG LABORATORIUM, DELFT (NETHERLANDS).
Influence of Suction and Blowing on Entrainment of Sand Particles,
W74-09616 2J

WEATHER SCIENCE, INC., NORMAN, OKLA.
Project CUM II--Studies of the Rain Parameters of Randomly Seeded Warm and Cold Cumuli,
W74-09370 3B

WEST VIRGINIA UNIV., MORGANTOWN.
Reduction in Moisture and Daily Removal of Wastes from Caged Laying Hens,
W74-09677 5D

WEST VIRGINIA UNIV., MORGANTOWN. DIV. OF RESOURCE MANAGEMENT.
Potential Citizen Initiated Legal Action Against Agricultural Pollution,
W74-09671 5G

WEYERHAEUSER CO., EVERETT, WASH.
Inplant pH Control Permits Optimum Aeration Efficiency,
W74-09445 5D

WHITMAN AND HOWARD, INC., BOSTON, MASS.
Small Town Spends a Big $8 Million,
W74-09711 5D

WILLIAMS COLL., WILLIAMSTOWN, MASS.
Controlling Pollution by Price and Standard Systems: A General Equilibrium analysis,
W74-09561 5G

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON. BUREAU OF RESEARCH.
Mercury Levels in Fish from Selected Wisconsin Waters (A Preliminary Report),
W74-09371 5A

WISCONSIN STATE UNIV., OSHKOSH. DEPT. OF GEOLOGY.
The Effect of an Artificial Lake Development Complex on the Groundwater System,
W74-09591 5B

WISCONSIN UNIV., MADISON.
Some Historical Statistics Related to Future Standards,
W74-09505 5D

Pitfalls in Parameter Estimation for Oxygen Transfer Data,
W74-09514 5A

WISCONSIN UNIV., MADISON. DEPT. OF WATER CHEMISTRY.
Phosphorus Studies in Lower Green Bay, Lake Michigan,
W74-09435 5C

WISCONSIN UNIV., MADISON. INST. FOR ENVIRONMENTAL STUDIES.
Groundwater Quality, Door County, Wisconsin.
W74-09565 5B

WROCFAWSKI UNIV. (POLAND). INST. OF GEOGRAPHY.
Geyser-Like Water Spouts at Werenskioldbreen, Spitsbergen,
W74-09334 2C

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Snow Sampling Techniques on a Small Subalpine Watershed,
W74-09608 2C

YOKOHAMA NATIONAL UNIV. (JAPAN). SCHOOL OF ENGINEERING.
The Behaviors of Heavy Metals in the Regeneration Process of Sewage Treatment Activated Carbon, (Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo),
W74-09482 5D

YUGOSLAV ACADEMY OF SCIENCES AND ARTS, ZABREB. INST. FOR MEDICAL RESEARCH.
Lead Concentration Found in Human Blood in Association with Lead Colic,
W74-09764 5C

YUGOSLAV DEPT. OF WATER TREATMENT PLANT AUTOMATION, BELGRADE.
Correlation Between Turbidity and Iron Content of the Filter Effluent of Well Origin,
W74-09526 5B

ZURICH UNIV. (SWITZERLAND). GEOGRAPHISCHES INSTITUT.
Snow Survey and Vegetation Growth in High Mountains (Swiss Alps),
W74-09320 2C

ACCESSION NUMBER INDEX

W74-09251 6B
W74-09252 6B
W74-09253 5D
W74-09254 5B
W74-09255 5A
W74-09256 3C
W74-09257 5G
W74-09258 6E
W74-09259 8B
W74-09260 5G
W74-09261 2H
W74-09262 8D
W74-09263 4A
W74-09264 4A
W74-09265 5D
W74-09266 8C
W74-09267 4A
W74-09268 4A
W74-09269 4A
W74-09270 4A
W74-09271 4A
W74-09272 4A
W74-09273 4A
W74-09274 4A
W74-09275 4A
W74-09276 4A
W74-09277 6E
W74-09278 4A
W74-09279 4A
W74-09280 3A
W74-09281 6E
W74-09282 5G
W74-09283 5G
W74-09284 8I
W74-09285 6E
W74-09286 6E
W74-09287 6E
W74-09288 6E
W74-09289 6E
W74-09290 6E
W74-09291 6E
W74-09292 6E
W74-09293 6E
W74-09294 6E
W74-09295 6E
W74-09296 6E
W74-09297 6E
W74-09298 6E
W74-09299 6E
W74-09300 6E
W74-09301 6E
W74-09302 6E
W74-09303 6E
W74-09304 6E
W74-09305 6E
W74-09306 6E
W74-09307 6E
W74-09308 6E
W74-09309 6E
W74-09310 6E
W74-09311 6E
W74-09312 6E
W74-09313 8I
W74-09314 6E
W74-09315 5C
W74-09316 6E
W74-09317 5G
W74-09318 6E
W74-09319 5E
W74-09320 2C
W74-09321 5G
W74-09322 3B
W74-09323 5G
W74-09324 5G
W74-09325 2C
W74-09326 2C
W74-09327 2C
W74-09328 2C
W74-09329 2C
W74-09330 2C
W74-09331 2C
W74-09332 2C
W74-09333 2C
W74-09334 2C
W74-09335 2C
W74-09336 2C
W74-09337 2C
W74-09338 2C
W74-09339 2C
W74-09340 2C
W74-09341 2C
W74-09342 2C
W74-09343 2C
W74-09344 2C
W74-09345 2C
W74-09346 2C
W74-09347 2C
W74-09348 2C
W74-09349 2C
W74-09350 2H
W74-09351 5B
W74-09352 4B
W74-09353 5G
W74-09354 4A
W74-09355 4A
W74-09356 4A
W74-09357 4A
W74-09358 4A
W74-09359 5D
W74-09360 6B
W74-09361 5D
W74-09362 5B
W74-09363 5G
W74-09364 6A
W74-09365 4A
W74-09366 4B
W74-09367 7C
W74-09368 2L
W74-09369 5B
W74-09370 3B
W74-09371 5A
W74-09372 2H
W74-09373 5D
W74-09374 5G
W74-09375 5B
W74-09376 5D
W74-09377 5D
W74-09378 3B
W74-09379 2L
W74-09380 2L
W74-09381 2L
W74-09382 2L
W74-09383 2L
W74-09384 5C
W74-09385 5B
W74-09386 5A
W74-09387 2L
W74-09388 2L
W74-09389 2L
W74-09390 2E
W74-09391 2E
W74-09392 2E
W74-09393 2E
W74-09394 2E
W74-09395 2E
W74-09396 2E
W74-09397 4A
W74-09398 4A
W74-09399 7C
W74-09400 4A
W74-09401 7C
W74-09402 2H
W74-09403 5D
W74-09404 6B
W74-09405 4C
W74-09406 2B
W74-09407 2H
W74-09408 5B
W74-09409 2F
W74-09410 5D
W74-09411 4C
W74-09412 4A
W74-09413 6E
W74-09414 6E
W74-09415 4A
W74-09416 4A
W74-09417 6B
W74-09418 6B
W74-09419 4A
W74-09420 6B
W74-09421 6E
W74-09422 5D
W74-09423 5D
W74-09424 5D
W74-09425 5D
W74-09426 5D
W74-09427 5D
W74-09428 5D
W74-09429 5D
W74-09430 5D
W74-09431 5A
W74-09432 5C
W74-09433 2H
W74-09434 5D
W74-09435 5C
W74-09436 5G
W74-09437 5D
W74-09438 5G
W74-09439 5D
W74-09440 5B
W74-09441 5D
W74-09442 5B
W74-09443 5G
W74-09444 5D
W74-09445 5D
W74-09446 2H
W74-09447 5D
W74-09448 5C
W74-09449 2H
W74-09450 5D
W74-09451 5D
W74-09452 5D
W74-09453 5D
W74-09454 5C
W74-09455 5D
W74-09456 5D
W74-09457 5D
W74-09458 5G
W74-09459 5C
W74-09460 5C
W74-09461 5D
W74-09462 5C
W74-09463 5C
W74-09464 5D
W74-09465 5B
W74-09466 5B
W74-09467 5D
W74-09468 5B
W74-09469 4A
W74-09470 5D
W74-09471 5D
W74-09472 5B
W74-09473 5D
W74-09474 5D
W74-09475 5D
W74-09476 3F
W74-09477 4B
W74-09478 4A
W74-09479 3D
W74-09480 2E
W74-09481 8A
W74-09482 5D
W74-09483 6C
W74-09484 5A
W74-09485 4A
W74-09486 5D
W74-09487 5D
W74-09488 5D
W74-09489 5C
W74-09490 5D
W74-09491 5B
W74-09492 5C
W74-09493 5D
W74-09494 5D
W74-09495 4A
W74-09496 5D
W74-09497 5D
W74-09498 5C
W74-09499 5D
W74-09500 2I
W74-09501 8I
W74-09502 5B
W74-09503 5B
W74-09504 5D
W74-09505 5D
W74-09506 5E
W74-09507 2H
W74-09508 5D
W74-09509 4A
W74-09510 5D
W74-09511 5D
W74-09512 5A
W74-09513 5D
W74-09514 5A
W74-09515 5D
W74-09516 8C
W74-09517 5D
W74-09518 2G
W74-09519 5F
W74-09520 5D
W74-09521 5D
W74-09522 8F
W74-09523 8E
W74-09524 8G
W74-09525 5C
W74-09526 5B
W74-09527 8E
W74-09528 6B
W74-09529 4B
W74-09530 2I
W74-09531 5B
W74-09532 4B
W74-09533 4B
W74-09534 8D
W74-09535 8B
W74-09536 5B
W74-09537 4C
W74-09538 6B
W74-09539 5G
W74-09540 5C
W74-09541 5B
W74-09542 5B
W74-09543 4B
W74-09544 2F
W74-09545 7B
W74-09546 2D
W74-09547 5C
W74-09548 8G
W74-09549 8A
W74-09550 3F
W74-09551 3E
W74-09552 3E
W74-09553 6C
W74-09554 5D
W74-09555 4A
W74-09556 2L
W74-09557 5G
W74-09558 5G
W74-09559 4A
W74-09560 5G
W74-09561 5G
W74-09562 6B

W74-09563 5G
W74-09564 6B
W74-09565 5B
W74-09566 8I
W74-09567 6A
W74-09568 6A
W74-09569 6B
W74-09570 5B
W74-09571 5B
W74-09572 5C
W74-09573 5B
W74-09574 5B
W74-09575 5C
W74-09576 5C
W74-09577 5D
W74-09578 5B
W74-09579 5C
W74-09580 5B
W74-09581 5A
W74-09582 2L
W74-09583 5E
W74-09584 5A
W74-09585 5B
W74-09586 4A
W74-09587 2L
W74-09588 2C
W74-09589 5B
W74-09590 5B
W74-09591 5B
W74-09592 5B
W74-09593 5B
W74-09594 5B
W74-09595 5B
W74-09596 5B
W74-09597 5B
W74-09598 5B
W74-09599 2G
W74-09600 2I
W74-09601 4B
W74-09602 5B
W74-09603 2A
W74-09604 7B
W74-09605 4A
W74-09606 5B
W74-09607 2C
W74-09608 2C
W74-09609 2C
W74-09610 2C
W74-09611 2D
W74-09612 2C
W74-09613 2A
W74-09614 5G
W74-09615 2D
W74-09616 2J
W74-09617 4A
W74-09618 2J
W74-09619 2J
W74-09620 4B
W74-09621 2E
W74-09622 5A
W74-09623 5A
W74-09624 5B
W74-09625 2G
W74-09626 8B
W74-09627 8B
W74-09628 8B
W74-09629 2A
W74-09630 4A
W74-09631 5B
W74-09632 8B
W74-09633 5D
W74-09634 5D
W74-09635 5D
W74-09636 5F
W74-09637 5D
W74-09638 7C
W74-09639 7C
W74-09640 7C
W74-09641 2F
W74-09642 2H
W74-09643 4B
W74-09644 2K
W74-09645 2K
W74-09646 2H
W74-09647 4B
W74-09648 4B
W74-09649 2E
W74-09650 2K
W74-09651 6B
W74-09652 5D
W74-09653 5G
W74-09654 6A
W74-09655 2B
W74-09656 6B
W74-09657 6B
W74-09658 6A
W74-09659 9A
W74-09660 5C
W74-09661 6B
W74-09662 5D
W74-09663 5D
W74-09664 5D
W74-09665 5G
W74-09666 5G
W74-09667 5G
W74-09668 5G
W74-09669 5G
W74-09670 5G
W74-09671 5G
W74-09672 5G
W74-09673 5D
W74-09674 5D
W74-09675 5D
W74-09676 5D
W74-09677 5D
W74-09678 5D
W74-09679 5D
W74-09680 5B
W74-09681 5B
W74-09682 5D
W74-09683 5D
W74-09684 5D
W74-09685 5D
W74-09686 5D
W74-09687 5D
W74-09688 5D
W74-09689 5D
W74-09690 5D
W74-09691 5D
W74-09692 5D
W74-09693 5D
W74-09694 5D
W74-09695 5D
W74-09696 5D
W74-09697 5B
W74-09698 5D
W74-09699 5D
W74-09700 5D
W74-09701 5D
W74-09702 5B
W74-09703 5D
W74-09704 5D
W74-09705 5D
W74-09706 5D
W74-09707 5D
W74-09708 5D
W74-09709 5D
W74-09710 5D
W74-09711 5D
W74-09712 5D
W74-09713 5D
W74-09714 5D
W74-09715 5D
W74-09716 5D
W74-09717 5G
W74-09718 5D
W74-09719 5D
W74-09720 8A
W74-09721 5D
W74-09722 8C
W74-09723 2I
W74-09724 5D
W74-09725 5D
W74-09726 8B
W74-09727 8A
W74-09728 8B
W74-09729 5D
W74-09730 3F
W74-09731 5D
W74-09732 5D
W74-09733 5C
W74-09734 6B
W74-09735 5G
W74-09736 5D
W74-09737 2I
W74-09738 5D
W74-09739 4A
W74-09740 2E
W74-09741 5B
W74-09742 5A
W74-09743 5D
W74-09744 5D
W74-09745 5D
W74-09746 2I
W74-09747 5D
W74-09748 5G
W74-09749 5D
W74-09750 2I
W74-09751 2H
W74-09752 2H
W74-09753 5G
W74-09754 8I
W74-09755 5G
W74-09756 5A
W74-09757 2C
W74-09758 5C
W74-09759 5A
W74-09760 5A
W74-09761 5C
W74-09762 5B
W74-09763 5A
W74-09764 5C
W74-09765 5A
W74-09766 5C
W74-09767 5G
W74-09768 8I
W74-09769 5C
W74-09770 5A
W74-09771 5A
W74-09772 5A
W74-09773 5F
W74-09774 5A
W74-09775 5F
W74-09776 5F
W74-09777 5B
W74-09778 5C
W74-09779 5B
W74-09780 5C
W74-09781 8I
W74-09782 5A
W74-09783 5A
W74-09784 5D
W74-09785 5C
W74-09786 5C
W74-09787 5C
W74-09788 5C
W74-09789 5C
W74-09790 5C
W74-09791 5B
W74-09792 5A
W74-09793 5C
W74-09794 8C
W74-09795 3F
W74-09796 3C
W74-09797 2G
W74-09798 3F
W74-09799 3F
W74-09800 3F

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W74-09431	1
Colorado State University, Irrigation Return Flow Quality	W74-09794 -- 09800	7
Cornell University, Policy Models for Water Resources Systems	W74-09476 -- 09479	4
East Central State College, Agricultural Livestock Wastes	W74-09663 -- 09709	47
Franklin Institute (FIRL), Municipal Wastewater Treatment Technology	W74-09480 -- 09484 09486 -- 09499 09502 -- 09506 09508 -- 09521 09710 -- 09722 09724 -- 09729 09731 -- 09736 09738 -- 09745 09747 -- 09749	74
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W74-09434 -- 09445 09447 -- 09448 09450 -- 09468 09470 -- 09471 09473 -- 09475	38
National Water Well Association, Water Well Construction Technology	W74-09522 -- 09524 09526 -- 09529 09531 -- 09539 09542 -- 09549	24
University of Florida, Eastern U.S. Water Law	W74-09257 -- 09283 09285 -- 09312 09314 -- 09316 09318	59
University of North Carolina, Metropolitan Water Resources Planning and Management	W74-09353 -- 09359 09412 -- 09421	17
University of Wisconsin, Water Resources Economics	W74-09550 -- 09569 09651	21
U.S. Geological Survey, Hydrology	W74-09319 -- 09350 09352 09366 -- 09411 09422 -- 09430 09582 -- 09599 09601 -- 09650 09752 -- 09753 09755 -- 09757	161
Vanderbilt University, Metals Pollution	W74-09570 -- 09581 09758 -- 09767 09769 -- 09780 09782 -- 09793	46

ABSTRACT SOURCES

Source	Accession Number	Total
B. State Water Resources Research Institutes		
Arizona Water Resources Research Center	W74-09253	1
California Water Resources Center	W74-09659	1
Hawaii Water Resources Research Center	W74-09655	1
Minnesota Water Resources Research Center	W74-09656	1
Missouri Water Resources Research Center	W74-09660	1
North Carolina Water Resources Research Institute	W74-09657	1
North Dakota Water Resources Research Institute	W74-09361	1
Puerto Rico Water Resources Research Institute	W74-09362	1
Rhode Island Water Resources Center	W74-09254 -- 09255	2
South Carolina Water Resources Research Institute	W74-09363	1
Texas Water Resources Institute	W74-09364, 09661	2
Virginia Water Resources Research Center	W74-09256, 09658	2
C. Other		
BioSciences Information Service	W74-09284, 09313 09317, 09351 09365, 09433 09446, 09449 09469, 09472 09485 09500 -- 09501 09507, 09525 09530 09540 -- 09541 09600, 09723 09730, 09737 09746 09750 -- 09751 09754, 09768 09781	28
Environmental Protection Agency	W74-09432	1
Office of Water Resources Research	W74-09251 -- 09252 09360 09652 -- 09654 09662	7

* U. S. GOVERNMENT PRINTING OFFICE : 1974 582-935/5

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
Springfield, Va. 22151

OFFICIAL BUSINESS

PRINTED MATTER

AN EQUAL OPPORTUNITY EMPLOYER

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM 211

SWRA
XEROX UNIVERSITY MICROFILMS
SERIALS DEPARTMENT
300 NORTH ZEEB RCAD
ANN ARBOR MI 48106

X7506300
C01